Exhibit U

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SPIN MASTER LTD.,
Petitioner

v.

SPHERO, INC.,
Patent Owner.

Case No. IPR2017-01272
U.S. Patent No. 9,211,920 B1

PETITION FOR *INTER PARTES* REVIEW

OF U.S. PATENT NO. 9,211,920 B1

TABLE OF CONTENTS

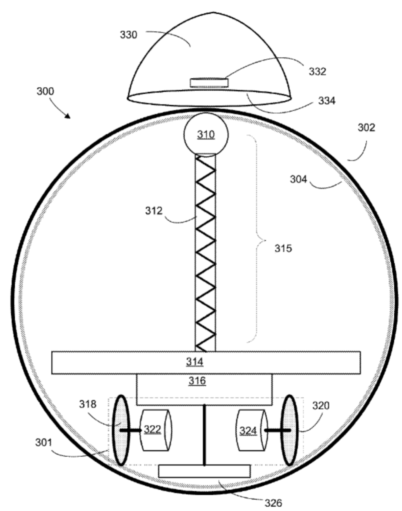
I. INTRODUCTION

Spin Master Ltd. ("Petitioner") requests *Inter Partes* Review ("IPR") of claims 1-3, 6-11, 13-18, and 21 (the "Challenged Claims") of U.S. Patent No. 9,211,920 ("the '920 Patent"), assigned to Sphero, Inc. ("Sphero") (Ex. 1001).

II. OVERVIEW OF THE '920 PATENT

A. Description of the Alleged Invention of the '920 Patent

The '920 Patent generally describes a self-propelled device 300 including a spherical housing 302 and an external, magnetically-attached accessory device 330. (Ex.1001(Abstract)).

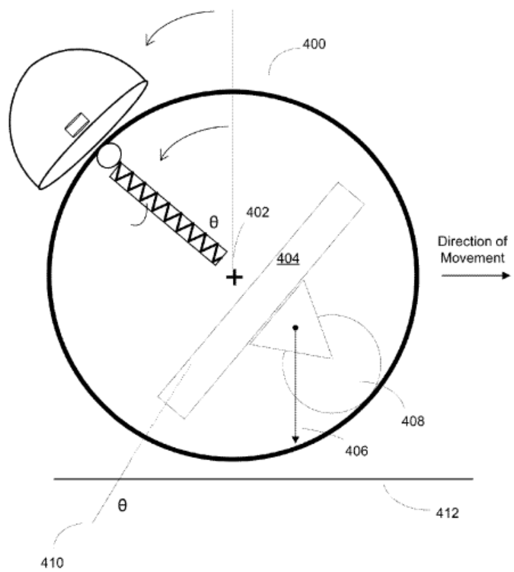


Id. at Fig. 3.

The spherical housing includes a drive system 301 having wheels 318,320 driven by motors 322,324. *Id*. at 9:41-44;Fig.3. The spherical housing also includes an internal component comprising a biasing mechanism 315 having a spring 312 and a spring end 310. *Id*. at 9:53-58. The spring end of the internal

component includes a magnetic component that interacts with a magnetic component contained in the accessory device 330. *Id.* at 10:9-12,36-37. The self-propelled device "can be operated to move under control of another device, such as a computing device operated by a user." *Id.* at 3:38-41;6:15-35;Fig. 2.

In operation, the accessory device and spherical housing remain magnetically coupled, including when the biasing mechanism tilts or "pitches" during acceleration. *Id.* at 10:20-36;12:26-38.



Id. at Fig. 4. As seen in the above Fig. 4, the internal component is angularly displaced in a direction opposite a direction of movement. The '920 Patent identifies the polar angle θ, shown in Fig. 4, as a "variable tilt angle … that remains somewhat minimal, but in most cases, does not typically exceed 45 degrees, except during periods of relatively extreme acceleration." *Id.* at 12:29-35. The '920 Patent further describes that "during continuous and stable maneuvering

of the self-propelled device 300, the tilt of the biasing mechanism 315 may be closer to naught, or within 10 degrees." *Id*. at 12:35-38.

B. Summary of the Prosecution History of the '920 Patent

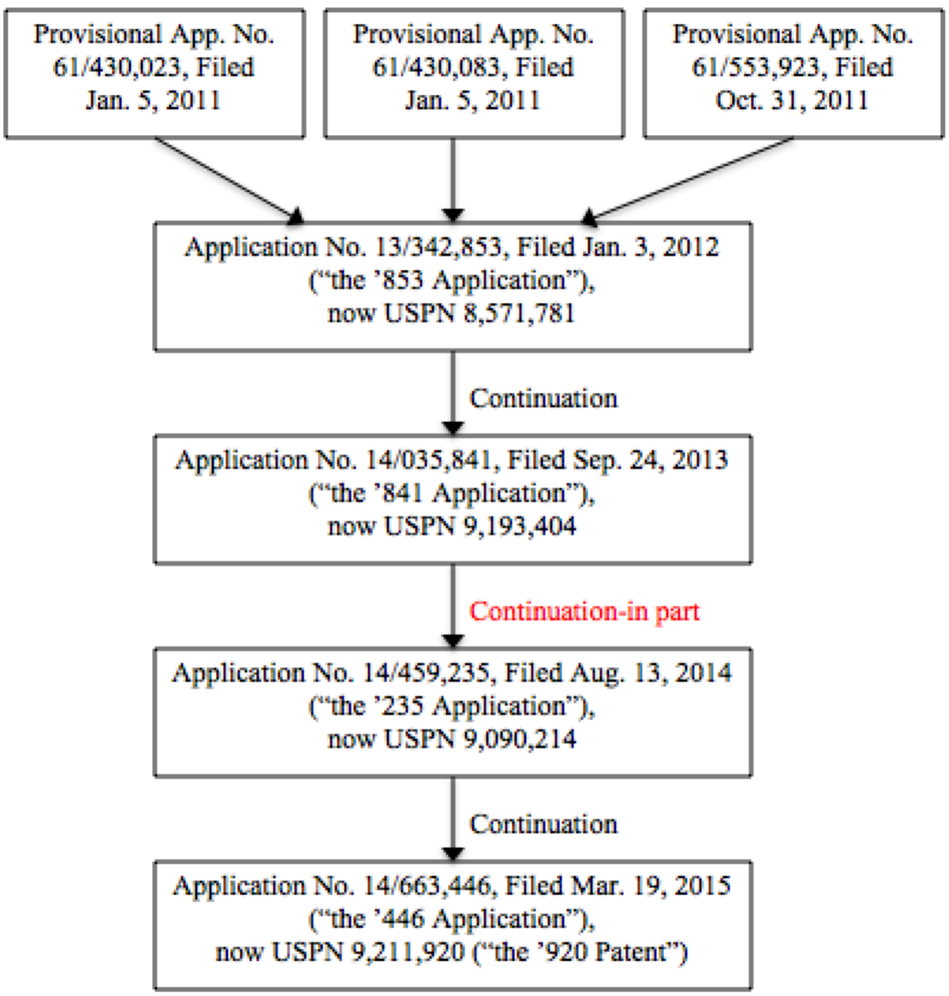
The '920 Patent was filed on March 19, 2015, claiming priority to several applications dating back to January 5, 2011. (Ex.1002:169-213). Prior to examination of the '920 Patent application, Applicant filed several preliminary amendments. *Id.* at 48-54, 60-66, 70-75, 143-148. On September 25, 2015, the Examiner issued a Notice of Allowance allowing pending claims 1, 2, 4-17, and 19-23. *Id*. at 25-32. In the Notice of Allowance, there is no indication that the Examiner substantively considered even a single prior art reference. *Id.* Claims 1, 2, 4-17, and 19-26 subsequently issued as claims 1-24 on December 15, 2015. *Id*. at 2.

C. Priority Date of the '920 Patent

The '920 Patent purports to claim priority back to provisional applications filed on January 5, 2011. To claim priority, however, the claims at issue must be directed to subject matter disclosed in the prior application(s) in the manner provided by 35 U.S.C. § 112(a), and must contain a written description of the invention. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562-63 (Fed. Cir. 1991); *Reckitt Benckiser LLC v. Ansell Healthcare Products LLC,* IPR2017-00066, Paper 9 at 5-7 (P.T.A.B. February 2017) (finding that a prior application to which the

patent-in-suit claimed priority was prior art under 35 U.S.C. § 102(a)(1) (post-AIA) because the priority application did not disclose the claimed subject matter). *All claims* of the '920 Patent are only entitled to claim priority to Application No. 14/459,235 ("the '235 Application"), filed August 13, 2014. *Lucent Techs., Inc. v. Gateway, Inc.*, 543 F.3d 710, 718 (Fed. Cir. 2008) ("Patent claims are awarded priority on a claim-by-claim basis based on the disclosure in the priority application[].").

The full priority chain of the '920 Patent is shown in the diagram below:



The ’235 Application added the new matter of an “external accessory” device in contact with the outer surface of the spherical housing. (Ex.1003:¶0009). The accessory device includes a magnetic coupling component that interacts with another magnetic coupling component on the biasing mechanism within the spherical housing. *Id.* at ¶¶0009-0011. The accessory device and the associated magnetic coupling of the accessory device to the spherical housing were not described in the ’841 Application or any of the other priority documents. (Ex.1004; Ex.1005; Ex.1006; Ex.1007; Ex.1008).

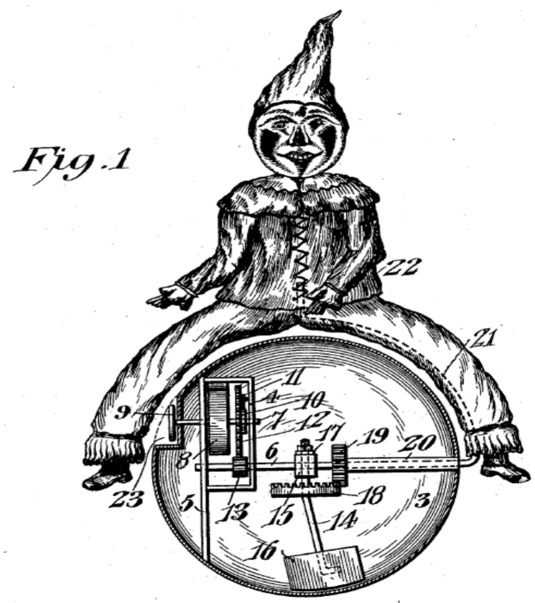
Claim 1 of the ’920 Patent recites the accessory device and magnetic coupling components. (Ex.1001:14:43-51,55-57,61-64). Because all of the dependent claims of the ’920 Patent ultimately depend from claim 1, they necessarily include the limitations of claim 1, including the “accessory device” limitations. Further, because the “accessory device” limitations were not described in any priority document prior to the ’235 Application filed August 13, 2014, the earliest effective filing date for all claims of the ’920 Patent is August 13, 2014.

Since the subject matter of the “accessory device” limitations was new matter in an application having a filing date *after* March 16, 2013 (the AIA transition date), the ’920 Patent should have been examined under the AIA legal framework. *See*, MPEP 2159. However, Applicant failed to provide a statement under 37 CFR § 1.78 informing the PTO that the application contained claims that

did not find support in the applications to which priority was sought. (Ex.1002:172). As such, the ’920 Patent was erroneously examined under the pre-AIA framework. *Id.* at 30 (“The present application is being examined under the pre-AIA first to invent provisions.”). For all of the reasons described above, the ’920 Patent should have been examined under the AIA framework and this proceeding should also proceed under the AIA framework.

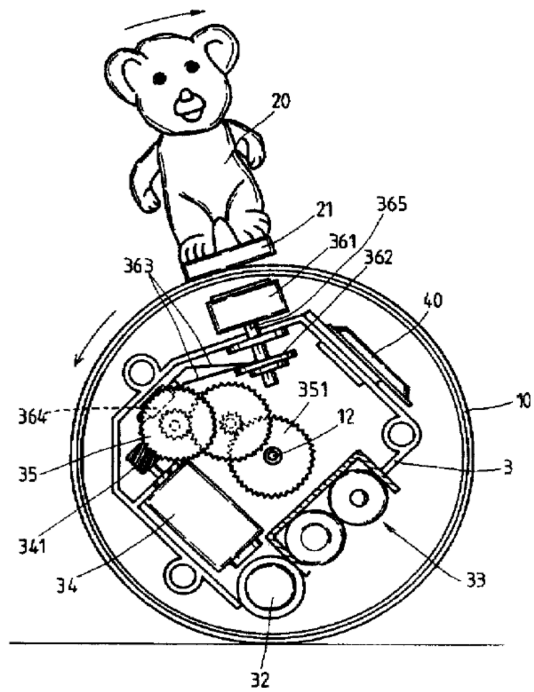
D. Background of the Prior Art and Summary of Unpatentability

Self propelled spherical devices as well as accessories attached to those devices were well known in the prior art for over a century prior to the alleged invention of the ’920 Patent. (Ex.1012:¶¶33-51). As opined by Dr. Janét, the following figure is from a patent issued in 1909 that describes a mechanical toy ball having an internal mechanism that rotates the ball and “a figure or other amusing device” attached to the ball:



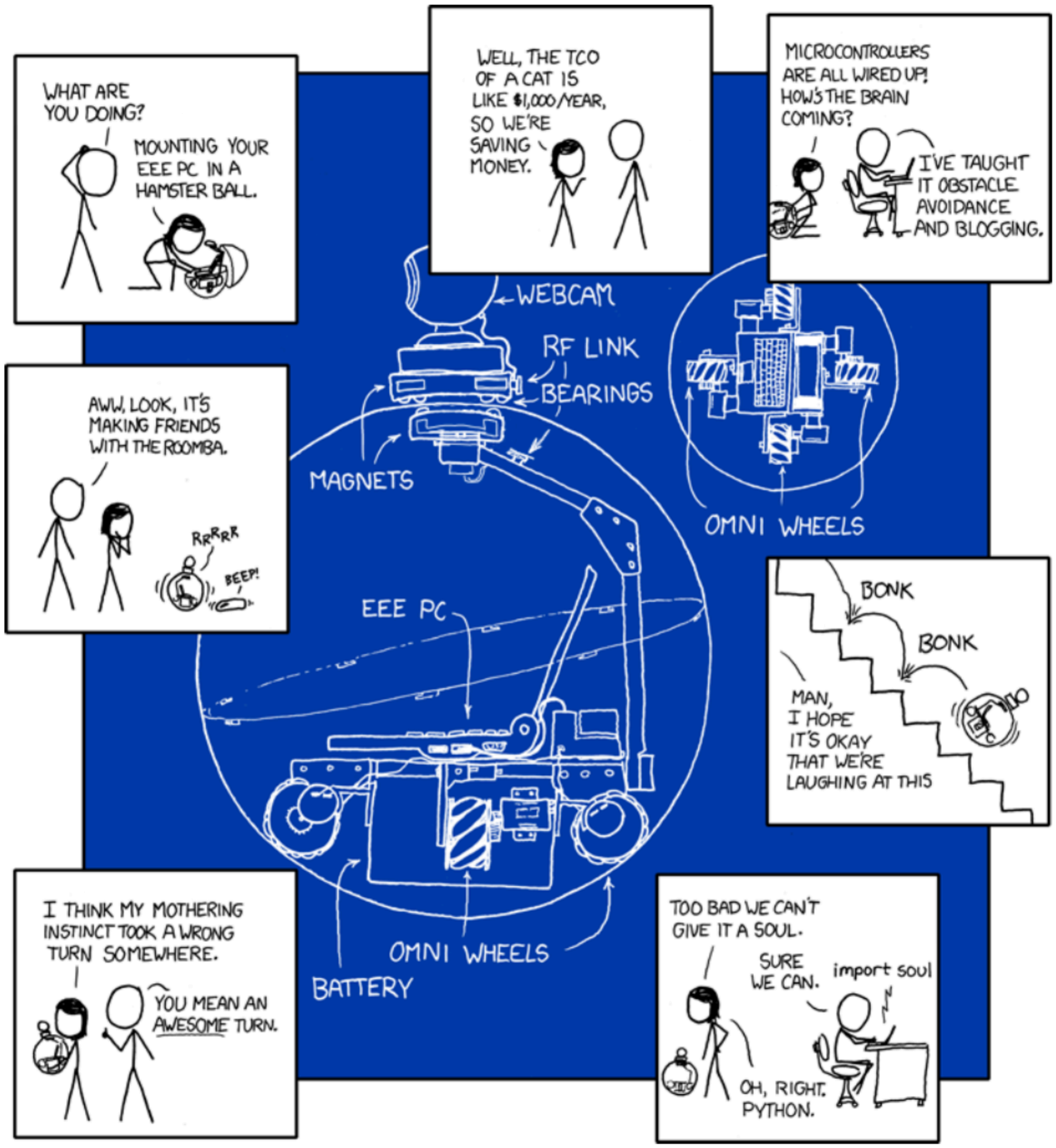
Id. at ¶¶33,49 (citing Ex.1014).

The magnetic coupling of accessories to self-propelled spherical devices was also well known. (Ex.1012:¶¶50-51). As opined by Dr. Janét, the following figure from a patent that issued in 1997 shows a self-propelled spherical device with an attachment coupled to the exterior of the sphere via the interaction between a first magnet located within the sphere (361) and a second magnet on the accessory (21):



Id. at ¶50 (citing Ex.1026).

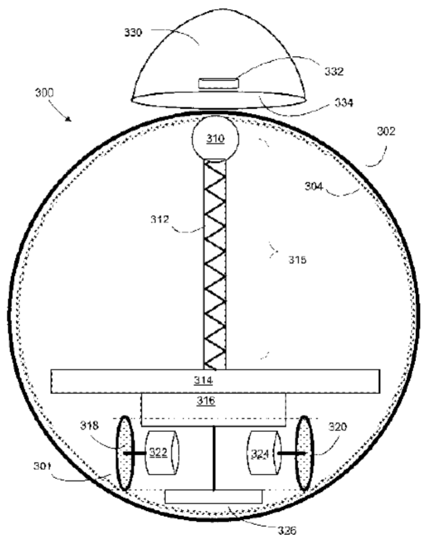
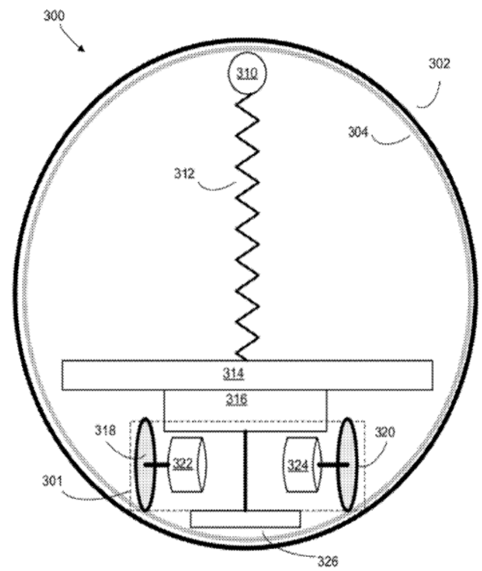
Such magnetic coupling is also demonstrated in the acclaimed xkcd comic strip by Randall Munroe, which published in 2008. (Ex.1012:¶51). The schematic below shows an external webcam adhered to the external surface of the spherical robot using magnets positioned in the base of the webcam and within the sphere:



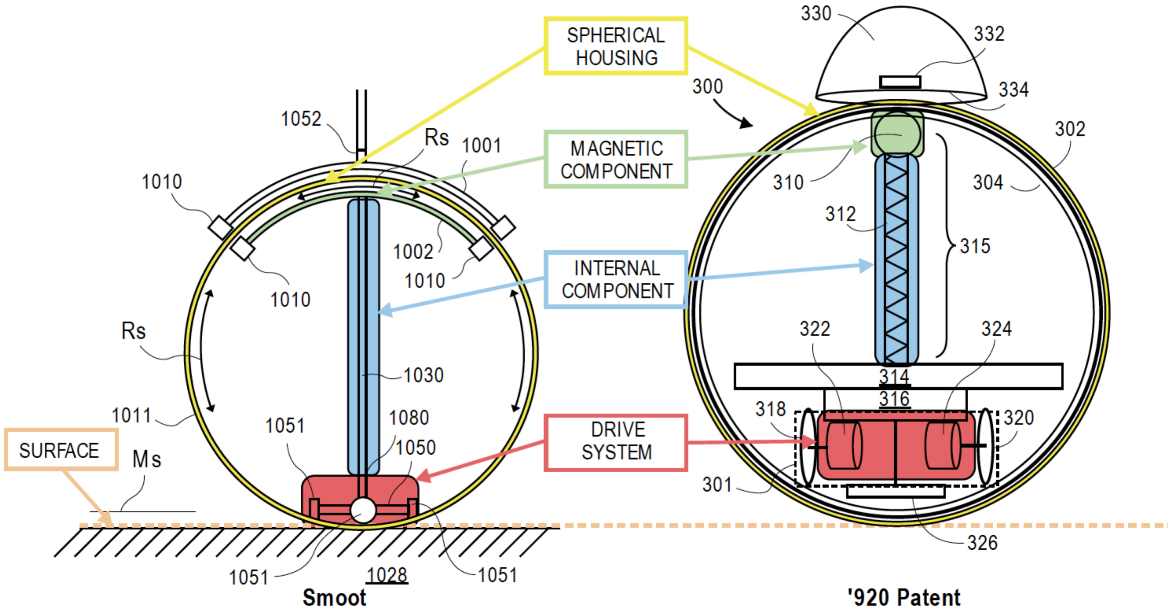
Id. (citing Ex.1027).

The drive system and other internal components claimed by the ’920 Patent were also not novel. (Ex.1012:¶¶40-41). Sphero’s own prior art (Ex.1010) discloses the same drive system and internal component claimed in the present invention. The only difference between the spherical device claimed in the ’920

Patent and the spherical device disclosed by Sphero's own prior art is the accessory device magnetically coupled to the **exterior of the sphere**:

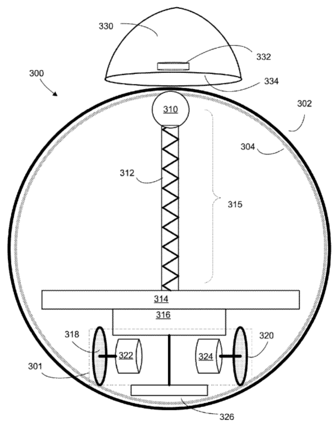
Ex.1001 at Fig. 3	Ex.1010 at Fig. 3
	

One large last prior art hurdle Sphero must overcome is U.S. Patent No. 8,269,447 to Smoot (Ex.1009), which issued to Disney Enterprises, Inc. and was filed in 2010. (Ex.1009). Smoot describes a self-propelled, spherical device including an accessory device magnetically coupled to an outer surface of a spherical housing. *Infra* at Section IV.A. As shown in the side-by-side comparison of figures from Smoot and the '920 Patent, Smoot discloses the same drive system, internal vertical member extending through the sphere, magnetic component at the end of the internal member and opposite the drive system, and accessory device external to the sphere and magnetically attracted to the sphere:



Comparison of Figure 10 of Smoot (Ex.1009) and Fig. 3 of the ’920 Patent (Ex.1001) (with modifications).

It is not surprising that Disney’s prior art is so similar to the ’920 Patent. The inventors Adam Wilson and Ian Bernstein of the ’920 Patent attended meetings at Disney with CEO Robert Iger shortly before the filing of the ’235 Application (the application to which the ’920 Patent directly claims priority). (Ex.1028). During the meeting, Mr. Iger showed the inventors secret photos of BB-8 from the filming of the movie *Star Wars: Episode VII – The Force Awakens*. *Id.* The similarities between Sphero’s ’235 Application and Disney’s BB-8 are startling:



Comparison of Fig. 3 of the ’920 Patent (Ex.1001) with Ex.1029.

Given the overwhelming field of prior art, each of the Challenged Claims is plainly unpatentable.

III. REQUIREMENTS FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies that the ’920 Patent is available for IPR and that the Petitioner is not barred or estopped from requesting IPR challenging the claims of the ’920 Patent.

B. Identification of the Challenged Claims Under 37 C.F.R. § 42.104(b) and Relief Requested

In view of the prior art and evidence discussed herein, Petitioner submits the Challenged Claims, i.e., claims 1-3, 6-11, 13-18, and 21, of the ’920 Patent are unpatentable and should be cancelled. 37 C.F.R. § 42.104(b)(1).

1. The Grounds for Challenge

Petitioner requests IPR of the Challenged Claims based on the prior art references and proposed rejections identified below. 37 C.F.R. § 42.104(b)(2).

Ground	Claims	Basis	References
Ground 1	1-3, 6-8, 11, 13-18, and 21	§ 103	Smoot (Ex.1009) in view of Wilson (Ex.1010)
Ground 2	1-3, 6-8, 11, 13-18, and 21	§ 103	Smoot in view of Wilson in further view of the knowledge of a POSITA
Ground 3	1-3, 6-11, 13-18, and 21	§ 103	Smoot in view of Wilson in further view of Van Kommer (Ex.1011)
Ground 4	1-3, 6-11, 13-18, and 21	§ 103	Smoot in view of Wilson in further view of Van Kommer and the knowledge of a POSITA

U.S. Patent No. 8,269,447 to Smoot et al. ("Smoot") issued on September 18, 2012, and is therefore prior art under at least AIA § 102(a)(1). (Ex. 1009)

U.S. Patent Application Publication No. 2012/0168240 to Wilson, et al. ("Wilson") published on July 5, 2012, and is therefore prior art under at least AIA § 102(a)(1). (Ex. 1010). Petitioner notes that inventor Wilson is also a named inventor of the '920 Patent. As discussed above, the Challenged Claims are entitled to an effective filing date of no earlier than August 13, 2014. *Supra* at

Section I.C. Accounting for the one-year grace period provided by 35 U.S.C. § 102(b)(1), Wilson is still prior art to the '920 Patent because it published over one year prior to August 12, 2014:

U.S. Patent No. 6,584,376 to Van Kommer ("Van Kommer") issued on June 24, 2003, and is therefore prior art under at least AIA § 102(a)(1). (Ex. 1011).

Section IV identifies where each element of the Challenged Claims is found in the prior art references. 37 C.F.R. § 42.104(b)(4). The exhibit numbers of the supporting evidence relied upon to support the challenges are provided above, and the relevance of the evidence to the challenges raised is provided in Section IV. 37 C.F.R. § 42.104(b)(5). Exhibits 1001–1031 are also attached.

2. Level of Skill of a Person Having Ordinary Skill in the Art

A person having ordinary skill in the art at the time of the earliest effective filing date of the '920 Patent, i.e., August 13, 2014, would have had an undergraduate degree or equivalent in physics, electrical engineering, mechanical engineering, or similar science or engineering degree, and at least two years of industry experience (or, with a graduate degree in the above-stated fields, at least one year of experience) in designing and developing robots and associated

technologies. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience. (Ex.1012:¶31).

C. Claim Construction

A claim in an unexpired patent subject to IPR receives the "broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs. v. Lee*, 136 S. Ct. 2131, 2135 (2016). Except for the terms listed below, Petitioner proposes that for purposes of IPR only, the claim terms of the '920 Patent be given their ordinary and customary meaning that the term would have to one of ordinary skill in the art.

1. "a contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing" (claim 1)

Claim 1 recites "an accessory device comprising … a contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing." (Ex.1001(14:43-46)). The '920 Patent specification states:

> The external accessory device 330 can be in the form of any shape and can be comprised of any suitable material. **A contact surface 334 of the external accessory device, or a surface closest to the outer surface of the spherical housing 302 (during magnetic interaction), can be formed to substantially correspond to the outer surface of the spherical housing 304.** As such, both the spherical housing 302 of the self-propelled device 300 and the external accessory device 330, namely the contact surface 334, can have substantially equivalent radii of curvature. In certain variation, this

> radius of curvature can be on the order of 10-30 cm. However, it is contemplated that other examples of self-propelled devices and accompanying external accessory devices may have a radius on the order of one meter upwards to the size of a human transportation vehicle and beyond.

Id. at 11:40-54 (emphasis added).

Therefore, the BRI of the limitation "a contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing" must at least include "a surface closest to the outer surface of the spherical housing that is formed to correspond to the outer surface of the spherical housing."

2. "wherein the hardware component causes the drive system to perform a feedback action in response to an event or condition" (claim 11)

Claim 11 recites the limitation "wherein the hardware component causes the drive system to perform a feedback action in response to an event or condition." *Id.* at 15:32-34. The '920 Patent specification does not use the terms "feedback action" or "event." However, the '920 Patent specification does disclose using sensors to monitor conditions, such as the self-propelled device's position and orientation:

> Sensors 112 can provide information about the surrounding environment and **condition** to the processor 114. In some variations, the sensors 112 include inertial measurement devices, including a three-axis gyroscope, a three-axis accelerometer, and/or a three-axis magnetometer. According to some variations, the sensors 114 provide input to enable the processor 114 to

> maintain awareness of the device's orientation and/or position relative to an initial reference frame after the device initiates movement.

Id. at 4:18-26 (emphasis added).

The processor uses the sensor input as part of a feedback control loop to control operation of the drive system:

> To achieve continuous motion at a constant velocity, the displacement of center of mass 406 relative to center of rotation 402 can be maintained by action of wheeled actuators 408. The displacement of the center of mass 406 relative to center of rotation 402 is difficult to measure, thus it is difficult to obtain **feedback for a closed-loop controller to maintain constant velocity**. However, the displacement is proportional to the angle 410 (equal to θ) between sensor platform 404 and surface 412. **The angle 410 can be sensed or estimated from a variety of sensor inputs. Therefore, as an example, the speed controller for robotic device 400 can be implemented to use angle 410 to regulate speed for wheeled actuators 408 causing device 400 to move at a constant speed across surface 412**. The speed controller can determine the desired angle 410 to produce the desired speed, and the desired angle set-point is provided as an input to a closed loop controller regulating the drive mechanism.
>
> FIG. 4 illustrates use of angle measurement for speed control; however **the technique can be extended to provide control of turns and rotations**, with feedback of appropriate sensed angles and angular rates.

Id. at 12:61–13:14 (emphasis added); *see also id.* at Fig. 4.

Therefore, the BRI of the term "wherein the hardware component causes the drive system to perform a feedback action in response to an event or condition" must at least include the hardware component performing feedback control to control operation of the drive system based on a sensed event or condition.

3. "wherein the processor illuminates each of the one or more illumination sources as a feedback response to a user interaction" (claim 16)

Claim 16 recites the limitation, "wherein the processor illuminates each of the one or more illumination sources as a feedback response to a user interaction." *Id.* at 16:8-10. The '920 Patent specification does not use the term "feedback response" nor does it describe illuminating an illumination source in response to a user interaction. However, the '841 Application, which is the grandparent to the '920 Patent and is incorporated by reference into the '920 Patent specification, discloses that a user interaction with a controller may result in the self-propelled device's processor altering the illumination output:

> In some embodiments or implementations, the input generated on the computing device 750 is interpreted as a command and then signaled to the self-propelled device 710. In other embodiments or implementations, the input entered on the computing device 750 is interpreted as a command by programmatic resources on the self-propelled device 710.… For example, **a user may enter a leftward gesture, which the device may interpret (based on runtime program 716A) as a command to** stop, spin, return home or **alter illumination output**, etc.

(Ex.1004:¶0123) (emphasis added). Related applications incorporated by reference are considered as part of the intrinsic record and are therefore informative for claim construction. *Goldenberg v. Cytogen*, 373 F.3d 1158, 1167 (Fed. Cir. 2004) (prosecution history of the parent application is treated "as part of the intrinsic evidence" of the child application when construing claim terms). Therefore, the BRI of the "wherein the processor illuminates each of the one or more illumination sources as a feedback response to a user interaction" must at least include the embodiment described in ¶0123 of the '841 Application (Ex.1004).

IV. THERE IS A REASONABLE LIKELIHOOD THAT AT LEAST ONE OF THE CHALLENGED CLAIMS IS UNPATENTABLE

A. Grounds 1 and 2: Claims 1-3, 6-8, 11, 13-18, and 21 Are Obvious Over Smoot and Wilson and/or Obvious Over Smoot, Wilson, and the Knowledge of a Person Having Ordinary Skill in the Art

The field of endeavor of the '920 Patent's claimed invention is, at least, self-propelled devices, including (but not limited to) self-propelled spherical devices: "The self-propelled device includes a spherical housing, and a drive system provided within the spherical housing to cause the self-propelled device to roll. " (Ex.1001:Abstract). Smoot (Ex. 1009) is analogous art because it is, at least, in the same field of endeavor as the claimed invention of the '920 Patent. Smoot discloses a spherical, self-propelled device including "a drive capable of interacting with the sphere to control rotation of the sphere." (Ex.1009(2:52-54)).

A controller controls "the drive (e.g., move with respect to the sphere) in order to … produce motion of the system with respect to a surface." *Id.* at 2:54-59; *see also id.* at Fig. 10.

Wilson (Ex. 1010) is analogous art because it is, at least, in the same field of endeavor as the claimed invention of the '920 Patent. Wilson discloses "a self-propelled device … which includes a drive system, a spherical housing, and a biasing mechanism." (Ex.1010:[0027]).

Claim 1. A system comprising: **[1(a)] a controller device;**

Claim 1 of the '920 Patent does not expressly recite whether the claimed "controller device" is internal to the self-propelled device or an external controller device. Claim 8 of the '920 Patent recites that the controller device receives user input and is "in wireless communication with the self-propelled device." Therefore, for at least claim 8, the claimed controller device is an external controller device. This is consistent with the '920 Patent specification, which describes an external computing device, such as a mobile phone, that can be used to control the self-propelled device. (Ex.1001:7:24-65). Regardless of whether the controller device of claim 1 is understood to be internal or external to the self-propelled device, Petitioner's Grounds 1 and 2 provide art teaching such.

As discussed below, Smoot discloses that its spherical self-propelled device includes an internal controller and a wireless communications module and is

operable to "receive commands from an external source." (Ex.1009:12:66–13:2). Smoot does not expressly disclose what is the "external source" from which the commands are received to instruct the described controller. However, in related art, Wilson teaches an external controller device for receiving user input to control the drive system of the claimed system. (Ex.1010:[0030],[0064]-[0065]).

Smoot discloses a system including "a sphere and a drive capable of interacting with the sphere to control rotation of the sphere." (Ex.1009:2:51-54). Inside the sphere there is "a controller that is operative to determine the position and/or movement of the drive in space and in turn control the drive … in order to … produce motion of the system with respect to a surface." *Id.* at 2:54-59. The controller includes a processor 510 and a wireless communications module 540, which is used "to receive commands from an external source (e.g., an operator supported by a drive or elsewhere) to control operation of a drive." *Id.* at 12:61–13:2; *see also id.* at 17:54-56 ("The movement of the object and sphere may be accomplished … by way of outside control in communication with the controller."); 11:51-59; Fig. 5. Smoot, Fig. 5 illustrates a controller 500, which may be incorporated in the locomotive drive 1050, comprising a processor 510, communications link 540, encoder interface 514, and other related components.

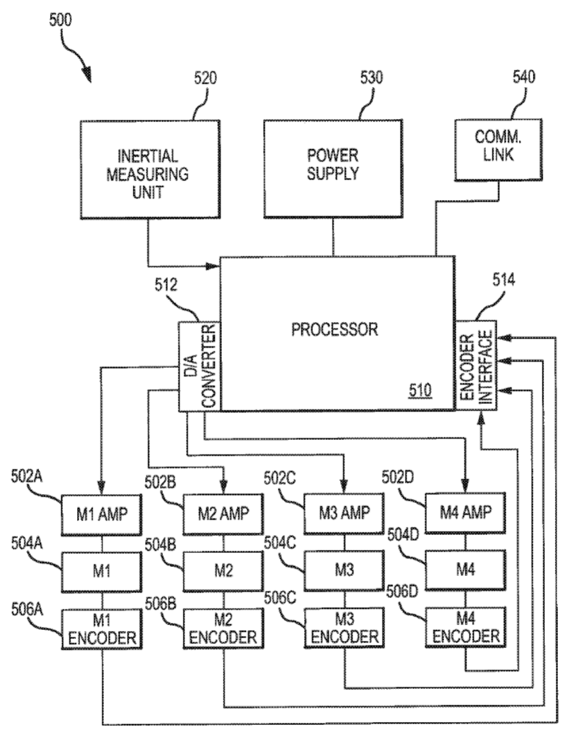
> FIG. 5 is a schematic drawing of an embodiment of controller 500 that may comprise the controllers 210, 310, and 410 previously described. . . . The

controller 500 may include a processor 510. Additionally, the controller 500 may include an inertial measuring unit 520.

Id. at 11:51-59.

Alternatively, the locomotive driver 1050 . . . may have a design similar to the drives 200, 300, or 400 (referenced in FIG. 2, FIG. 3 and FIG. 4, respectively).

Id. at 17:16-20.



Id. at Fig. 5.

Additionally, the controller 510 may include a communication link 540. The communication link 540 may comprise a wireless module (e.g., employing RF, Wi-Fi, or other appropriate wireless technology). The communication link 540 may transmit or receive data regarding the operation of the controller 510. For example, the **communication link 540 may be**

> **operative to receive commands from an external source (e.g., an operator supported by a drive or elsewhere) to control the operation of a drive.**

Id. at 12:61–13:2 (emphasis added).

> The movement of the object and sphere may be accomplished by a controller or by way of **outside control** in communication with the controller.

Id. at 17:54-56 (emphasis added).

Smoot therefore discloses a controller internal to the sphere and operable to receive instructions from an external control source for controlling the drive system of the sphere.

Wilson teaches a spherical, self-propelled device "operable to move under control of the controller device." (Ex.1010:[0029];[0027]). The controller device is a computing device, such as a smart phone, external to the sphere and "operable by a user to control the self-propelled device," including a direction of movement. *Id.* at [0030];[0029];[0065]-[0067];Fig.2A. The controller device "wirelessly communicate[s] control data to the self-propelled device 214 using a standard or proprietary wireless communication protocol." *Id.* at [0058];[0065]-[0067]. The self-propelled device "receive[s] one or more inputs from the controller device over the wireless communication port, map[s] each of the one or more inputs to a command based on a set of instructions, and control[s] the drive system using the

command determined for each of the one or more inputs." *Id.* at Abstract; *see also id.* at [0065]-[0067];[0031]-[0032];[0116]-[0123];Fig. 7.

> FIG. 2A is a schematic depiction of an embodiment comprising a self-propelled device and a computing device, under an embodiment. More specifically, a self-propelled device 214 is controlled in its movement by programming logic and/or controls that can originate from a controller device 208. The self-propelled device 214 is capable of movement under control of the computing device 208, which can be operated by a user 202. The computing device 208 can wirelessly communicate control data to the self-propelled device 214 using a standard or proprietary wireless communication protocol.

Id. at [0058].

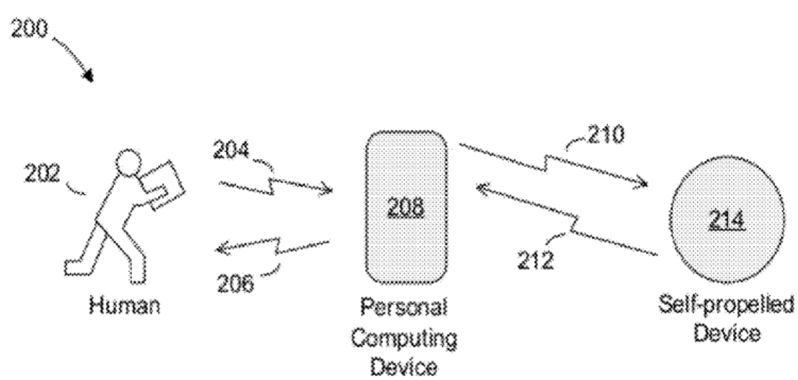


FIG. 2A

Id. at Fig.2A.

As discussed above, Smoot's spherical device wirelessly receives commands from an "external source" that are used to control the operation of the device's drive. (Ex.1009:12:61–13:2). It would have been obvious to a POSITA to utilize a

controller device, such as that taught by Wilson, as the external source used to generate and transmit control commands to Smoot's spherical device. (Ex.1012:¶91). Smoot's teaching of an "external source" or "outside control" providing wireless commands to the spherical device provides an express teaching, suggestion, or motivation that would have led a POSITA to include an external controller, such as taught by Wilson, in the system taught by Smoot. *Id.* at ¶92. A skilled artisan would have appreciated that Smoot's spherical device already includes the necessary electronic components needed to receive and process wireless commands from Wilson's external controller (i.e., wireless communications module 540 and processor 510). *Id.* at ¶93 Therefore, incorporating Wilson's external controller into Smoot's system would not require any physical modifications to Smoot's spherical device. *Id.* As such, substituting Wilson's external controller as the "external source" of control commands in Smoot's system would not change Smoot's principle of operation or render it inoperable for its intended purpose. *Id.*

Additionally, a POSITA would have understood that remote control devices, such as Wilson's controller device, have been used to allow operators to manually control motorized devices for many years prior to the '920 Patent. *Id.* at ¶91, ¶¶ 36-37. Therefore, using Wilson's controller as the external source of command signals would have predictably enabled an operator to control operation of the

drive within Smoot's spherical device. *Id.* at ¶91. Given the common and widespread use of remote control devices, a skilled artisan would have enjoyed a reasonable expectation of success incorporating Wilson's external controller into Smoot's system. *Id.*

Claim [1(b)(i)]: a self propelled device comprising a spherical housing,

Smoot discloses a self-propelled device having a spherical body (i.e., housing) enclosing a locomotive driver 1050 used to produce motion:

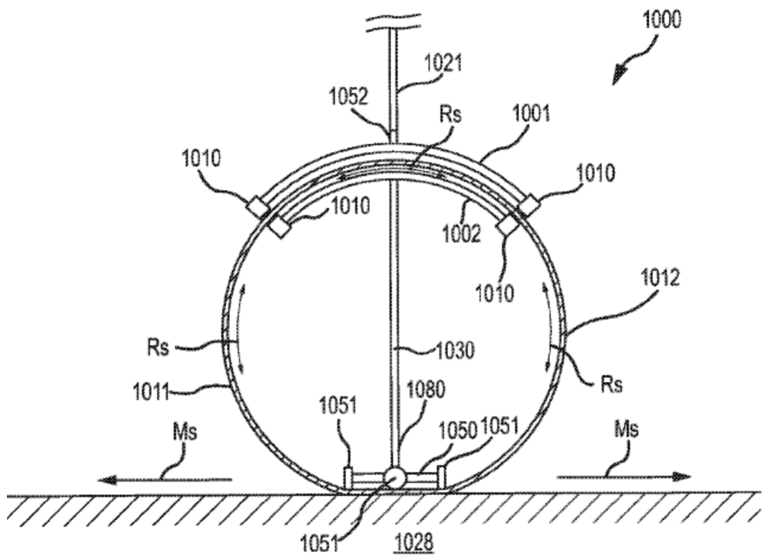


FIG.10

(Ex.1009:Fig.10). The "robotic drive system" is in contact with the sphere, controls rotation of a sphere, and enables holonomic motion of the sphere. *Id.* at Abstract.

> The present invention relates, generally, to a robotic drive system. Specifically, the present invention relates to a robotic system having a drive

> in contact with a sphere such that the drive is operable to control rotation of the sphere.

Id. at 1:6-9.

> A second aspect of the present invention includes a vehicle capable of moving with respect to a surface. The vehicle includes a substantially spherical body defining an interior volume and having a sidewall with an interior surface and an exterior surface. The vehicle further includes a locomotive drive within the interior volume that is supported on the surface and is engageable with the interior surface to produce rotation of the substantially spherical body such that the substantially spherical body rotates along the surface.

Id. at 4:60–5:1.

> The locomotive driver 1050 may move along the surface 1028 such that the sphere 1011 rolls beneath the locomotive driver 1050. The locomotive driver 1050 may in turn provide produce rotation (Rs) of the sphere 1011 resulting in movement (Ms) along the surface 1028 in a desired or predefined path.

Id. at 17:9-14.

Claim [1(b)(ii)]: a drive system provided within the spherical housing, one or more magnetic components, and an internal component that extends from the drive system to position the one or more magnetic components within an interior of the spherical housing, so as to be diametrically opposed to a point of contact between the spherical housing and an underlying surface;

Smoot discloses several embodiments of drive systems operable to rotate the sphere. In the embodiment of Fig. 10, discussed at Smoot, 16:55–17:48, a locomotive driver 1050 (i.e., the claimed "drive system") is provided within the

spherical body at the base. *Id.* at 4:60–5:8;16:63-66;Fig.10. This embodiment further includes the claimed "internal component," namely a "support beam 1030" positioned vertically within the sphere and extending from the locomotive driver 1050. *Id.* at 5:3-7;16:58–17:8;Fig.10.

The support beam positions an interior drive 1002, which is also referred to as an interior support or structure, carrying a magnet. *Id*. at 5:3-7(discussing the "interior support" that "contacts the interior surface [of the sphere] and includes a first magnetic holding portion");16:56–17:8;17:24-26;Fig.10. "[T]he locomotive driver, along with the support beam 1030, may support the interior drive 1002. *Id*. at 16:66–17:1. The locomotive driver 1050 is "encapsulated" by the sphere 1011 and "move[s] along the surface 1028 such that the sphere 1011 rolls beneath the locomotive driver 1050." *Id*. at 17:1-3,9-11.

The interior drive 1002 includes a first magnetic holding portion holding one or more magnets (i.e., magnetic components) against the top inside of the sphere. *Id.* at 5:7-8;5:23-28;14:39–15:30;16:58-61;Figs.7,10. Note that the discussion of the embodiment of Fig. 10 expressly states that the system 1000 may include an "interior holonomic drive 1002 similar to those described with referenced [sic] to FIG. 6." *Id*. at 16:56-58. Additionally, Fig. 7 and its related disclosure at Smoot, 14:39–15:30 discloses a "cutaway view of a holonomic drive system" including an interior holonomic drive 702 and an exterior holonomic drive 701 "adjacent to one

another and on opposite sides of a sphere sidewall 712" and maintained in the adjacent position via magnetic attraction. *Id*. at 14:39-48. Therefore, the disclosure in Smoot regarding the embodiment of Fig. 10 expressly includes the disclosure relative to the embodiment of Fig. 6, discussed at Smoot, 13:18–14:38, and the disclosure of the embodiment of Fig. 7, discussed at Smoot, 14:39–15:30. *See also id*. at 6:11-12.

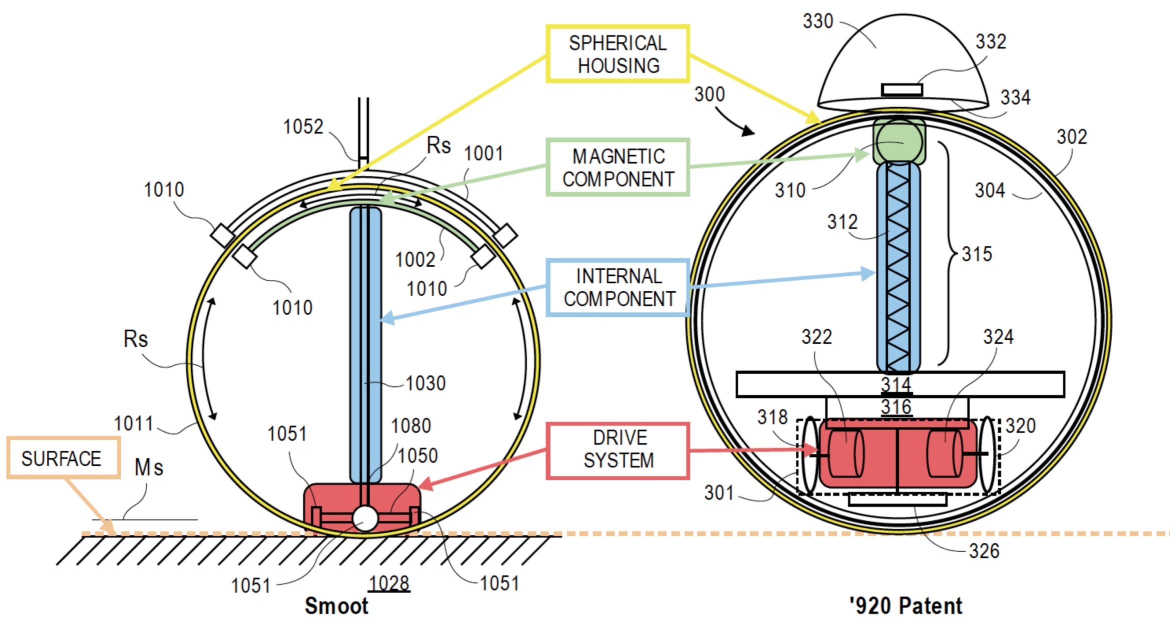
Returning to the discussion of Fig. 10, Smoot discloses that the interior drive 1002, which is supported by beam 1030, positions one or more magnets to be diametrically opposed to a point of contact between the spherical body and the underlying surface 1028:

> FIG. 10 depicts yet another alternative embodiment of a holonomic drive system 1000. The system 1000 may include an exterior drive 1001 and an interior holonomic drive 1002 similar to those described with referenced [sic] to FIG. 6. In this regard, the exterior drive 1001 may magnetically interact with the interior drive 1002 to maintain a relative position with each other on opposite sides of a sphere sidewall 1012. Additionally, the interior drive 1002 may have extending from it a support beam 1030. On the opposite end of the support beam 1030 from the interior drive 1002 may be a locomotive driver 1050. The locomotive driver 1050 may rest on and be supported by the surface 1028. **In this regard, the locomotive driver 1050, along with the support beam 1030, may support the interior drive 1002. As such, the interior drive 1002, support beam 1030, and locomotive driver 1050 may be encapsulated by the sphere 1011**. Notably, the sphere

> 1011 of the system 1000 may not provide support for the interior drive 1002 or the exterior drive 1001. **As such, control of the drives 1001, 1002 in order to achieve balancing of the drives may not be needed in that the drives may both be supported by the support beam 1030 and the locomotive driver 1050.**

Id. at 16:55-17:8 (emphases added).

As demonstrated by the following comparison of Smoot's Fig. 10 with Fig. 3 of the '920 Patent, the relative positioning of Smoot's drive system, internal component, and magnetic components is identical to that described in the '920 Patent:



Comparison of Figure 10 of Smoot (Ex.1009) and Fig. 3 of the '920 Patent (Ex.1001) (emphasis added).

Figure 7 discloses a close-up, cutaway view of the interior and exterior drives. *Id*. at Fig. 7;14:39-43. The drives, including the interior drive (denoted in orange), include magnets 720 (denoted in green):

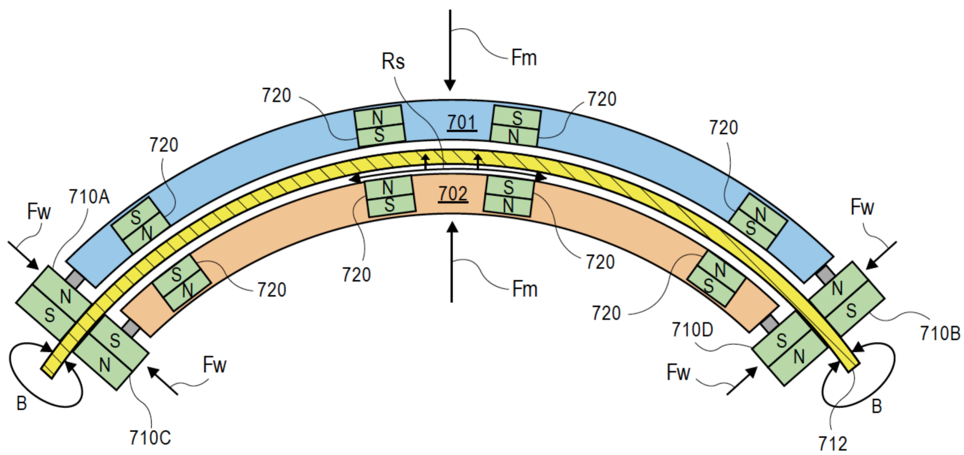


FIG. 7

Id. at Fig. 7 (emphasis added); *see also id.* at 15:9-14, 5:20-28 ("In one embodiment, the interior support may be a castored or gimbaled cylindrical magnet held against the top inside of the sphere that magnetically attracts the exterior support which may also be a castored or gimbaled cylindrical magnet."). As illustrated in Fig. 10, the interior drive 1002, including magnets 720, is diametrically opposed to a point of contact between the sphere sidewall 1012 and the underlying surface 1028. *Id.* at Fig. 10.

Additionally, Smoot teaches that instead of the multiple magnets disclosed in Fig. 7, "a single magnet may be provided on each of an exterior drive and an interior drive. For instance, the magnets **may be positioned at the center** or near

the center of each of an exterior drive and an interior drive." *Id.* 15:15-18 (emphasis added). Thus, Smoot teaches that the beam 1030 may position a magnet at the center of the interior drive, such that the magnet is diametrically opposed to a point of contact between the locomotive driver 1050 and the underlying surface 1028.

Petitioner notes that in some embodiments of Smoot, specifically the embodiment of Figs. 1-4, the drive system 100 comprises a single drive 120 sitting atop the sphere and operable to rotate the sphere. *Id.* at 6:14-57. In other embodiments, such as the embodiment of Fig. 8, the drive system includes both interior and exterior drives that "coordinate in order to produce movement of the drives 801, 802 with respect to the sphere 811." *Id.* at 15:37-40. In these embodiments, the single exterior drive (embodiments of Figs. 1-4) or the combined interior and exterior drives (embodiment of Fig. 8) enable the rotation of the sphere.

In contrast, the embodiments of Figs. 9-10 disclose a drive system that includes an internal locomotive driver 1050 for enabling rotation of the sphere. *See, e.g., id.* at 16:35-36;17:9-23. In the embodiment of Fig. 10, which includes the interior and exterior drives discussed above, Smoot teaches passive interior and exterior drives 1001,1002 that do not enable movement of the sphere, and instead, the internal locomotive drive 1050 enables rotation of the sphere:

> As mentioned, the embodiment of FIG. 10 may not include active balancing because the interior drive 1002 may be supported by the locomotive drive 1050 and support beam 1030. **In this regard, the interior drive 1001 and exterior drive 1002 may not move with respect to the sphere 1011 to produce rotation (Rs) of the sphere 1011. Because the locomotive drive 1050 may produce motion (Ms) of the sphere 1011 along the surface, the sidewall 1012 of the sphere 1011 may also be rotated (Rs) by the locomotive drive 1050 such that the sphere 1011 may roll along the surface 1028 under the locomotive driver 1050.**

Id. at 17:24-34 (emphasis added); *see also id.* at Fig.7;14:39-15:30. Petitioner provides this explanation of the various drive systems disclosed in Smoot to make clear that the interior and exterior drives 1001, 1002 do not enable rotation of the sphere, and instead, the locomotive driver 1050 internal to the sphere enables rotation of the sphere.

Claim [1(c)]: an accessory device comprising one or more magnetic components and a contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing, the contact surface of the accessory device being positionable along the exterior surface of the spherical housing to cause a magnetic interaction between the one or more magnetic components within the spherical housing and the one or more magnetic components of the accessory device;

The Fig. 10 embodiment of Smoot discloses an exterior drive 1001 positioned on the exterior surface of the spherical body. *Id*. at 16:56-61;Fig.10. The exterior drive 1001 is the claimed accessory device. *See also id*. at 5:8-11(describing the exterior drive as an "exterior support");17:49-63(describing that

"[i]n an embodiment, the holonomic drive system of the present invention may be used to support an object.… [T]he object may be supported by way of the coordinating internal and external drives and magnetic engagement therebetween along with a support beam and a locomotive drive."). The exterior drive includes a second magnetic holding portion holding one or more magnets (i.e., magnetic components) that "magnetically interact with the interior drive 1002 to maintain a relative position with each other on opposite sides of a sphere sidewall 1012." *Id.* at 16:58-61; *see also id* at 5:8-14,27-28.

> The interior support contacts the interior surface and includes a first magnetic holding portion. The vehicle also includes an exterior support contacting the exterior surface of the substantially spherical body on an opposite side of the sidewall as the interior support. The exterior support has a second magnetic holding portion in magnetic interaction with the first magnetic holding portion to produce an urging force relative to said interior and exterior supports.

Id. at 5:7-17.

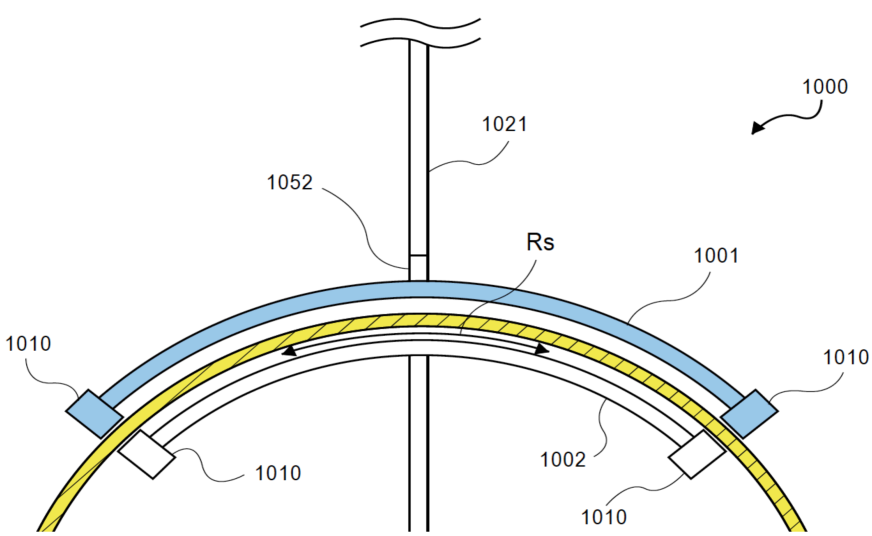
> In one embodiment, the interior support may be a castored or gimbaled cylindrical magnet held against the top inside of the sphere that magnetically attracts the exterior support which may also be a castored or gimbaled cylindrical magnet. Thus the external cylindrical magnet may be constrained to roll along with the internal cylindrical magnet.

Id. at 5:23-28.

> The system 1000 may include an exterior drive 1001 and an interior holonomic drive 1002 similar to those described with referenced to FIG. 6. In this regard, the exterior drive 1001 may magnetically interact with the interior drive 1002 to maintain a relative position with each other on opposite sides of a sphere sidewall 1012.

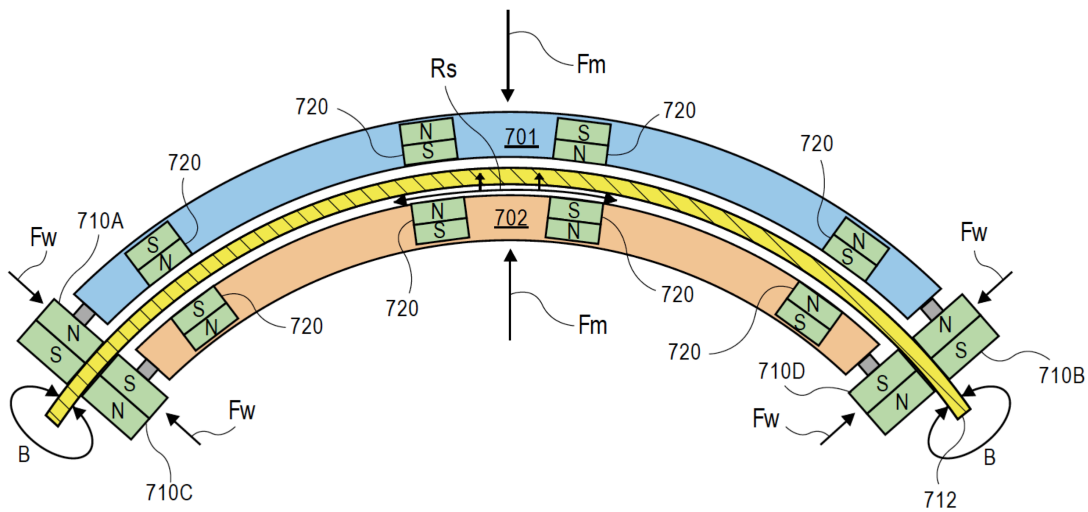
Id. at 16:56-61.

Smoot also discloses that the exterior drive 1001 has the claimed "contact surface having a radius of curvature that conforms to an exterior surface of the spherical housing." As depicted in the figure below, the exterior drive 1001 has a contact surface having a radius of curvature that conforms to the exterior surface of the spherical body. Thus, the surface of exterior drive 1001 closest to the outer surface of the spherical body (denoted in blue below) is formed to correspond to the outer surface of the spherical housing (denoted in yellow below):



Id. at Fig.10 (excerpt, emphasis added).

Figure 7 depicts a cross section of an embodiment of the exterior and interior drives (denoted in Fig. 7 as 701 and 702, respectively). The exterior drive (denoted in blue) is positioned along the exterior surface of the spherical body (denoted in yellow), and the interior drive 702 (denoted in orange) is held within the spherical body. A magnetic interaction occurs between magnetic components 720 (denoted in green) of the two drives.



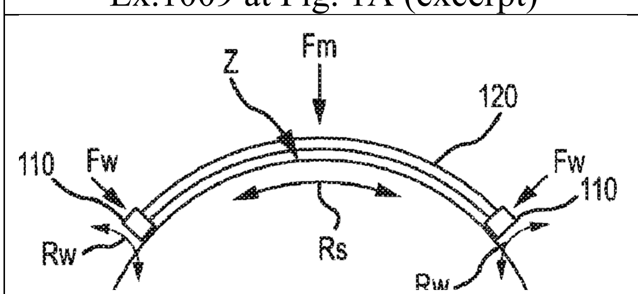
Id. at Fig.7 (emphasis added);14:39-48;14:56–15:30.

Smoot also expressly describes the contour of the exterior drive relative to the contour of the exterior of the sphere. In discussing the embodiment of Fig. 1, Smoot discloses that the exterior drive 120 "may be configured such that the contour of the sphere 111 is accommodated by a curved or angled drive body. It will be understood that the amount of such curving or angling may correspond to the contour of the sphere 111 …." *Id*. at 7:64-67;Fig.1A. This discussion of the exterior drive's 120 curvature for the Fig. 1A embodiment is equally applicable to

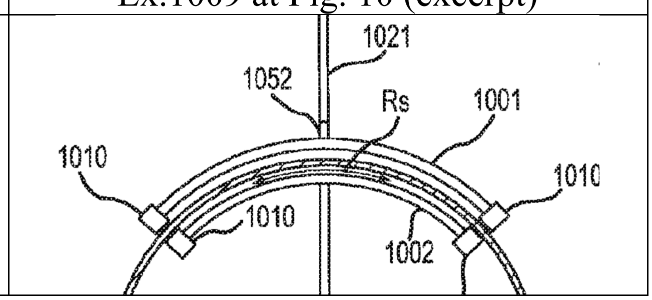
the exterior drive 1001 for the Fig. 10 embodiment. In particular, the system 1000 of Fig. 10 expressly includes exterior and interior drives "similar to those described with referenced [sic] to FIG. 6." *Id.* at 16:56-58. In turn, the description of the Fig. 6 embodiment expressly states the interior and exterior drives "may be generally of similar construction as any one of the drives 200, 300, and 400 described with respect to Fig. 2, FIG. 3, and FIG. 4. Furthermore, the system 600 incorporates features of the system described with respect to FIGS. 1A-C." *Id.* at 13:27-32. Finally, the exterior drive of the Fig. 2 embodiment may be used in a holonomic drive of Fig. 1. *Id.* at 8:26-27. Therefore, the disclosure of Fig. 10 incorporates the teachings regarding Fig. 1A and the curvature of the exterior drive.

This is confirmed by the side-by-side comparison of the embodiments of Fig. 1A and Fig. 10, which illustrates that the curvature of the exterior drive 1001 for Fig. 10 is the same as the curvature of the exterior drive 120 for Fig. 1A:

Ex.1009 at Fig. 1A (excerpt)



Ex.1009 at Fig. 10 (excerpt)



Thus, the exterior drive 1001 is configured such that the contour of the exterior of the sphere is accommodated by the curved or angled exterior drive 1001, and such curving or angling "corresponds to the contour of the sphere." *Id*. at 7:64-67.

Claim [1(d)(i)]: wherein the drive system is operable under control of the controller device to cause the spherical housing to maneuver, including to roll on the underlying surface,

Smoot's locomotive driver (i.e., drive system) includes motor-driven wheels or tracks used to produce "rotation (Rs) of the sphere 1011 resulting in movement (Ms) along the surface 1028 in a desired or predefined path." *Id.* at 17:9-23; 17:9-23;Fig.10; 4:64-5:1. The locomotive driver causes the sphere to "**roll** along the surface 1028 under the locomotive driver 1050." *Id.* at 17:29-34 (emphasis added). In one embodiment, the locomotive driver is controlled by an internal controller device 500 that wirelessly receives "commands from an external source (e.g., an operator supported by a drive or elsewhere) to control operation of a drive." *Id.* at 12:61-13:2; *see also id.* at 17:54-56 ("The movement of the object and sphere may be accomplished … by way of outside control in communication with the controller.");Fig. 5.

As discussed above with regard to limitation 1(a), Wilson teaches a remote controller device that "wirelessly communicate[s] control data to the self-propelled device 214 using a standard or proprietary wireless communication protocol." (Ex.1010:[0058]); *see also id.* at [0065]-[0067];Fig. 2A. The self-propelled device

"receive[s] one or more inputs from the controller device over the wireless communication port, map[s] each of the one or more inputs to a command based on a set of instructions, and control[s] the drive system using the command determined for each of the one or more inputs." *Id.* at Abstract. The controller device inputs may cause the self-propelled device to roll in a particular direction, for example. *Id.* at [0030]("The controller device includes a user interface for controlling at least a direction of movement of the self-propelled device");[0062]("[T]he self-propelled device 214 may correspond to a spherical object that can roll and/or perform other movements such as spinning."); *see also supra* at Wilson applied to limitation 1(a).

As discussed above, Smoot's spherical device wirelessly receives commands from an "external source" that are used to control the operation of the device's drive. (Ex.1009:12:61–13:2). For the reasons discussed above, it would have been obvious to a POSITA to utilize a controller device, as taught by Wilson, as the external source used to generate and transmit control commands causing Smoot's spherical device to maneuver. *See* Claim 1(a). Furthermore, a POSITA would understand that using Wilson's remote controller device as the external source of command signals would have predictably enabled an operator to control the drive to cause Smoot's spherical device to roll on the surface 1028. (Ex.1012:¶91).

Claim [1(d)(ii)]: the magnetic interaction causing the accessory device to maintain contact with the exterior surface of the spherical housing as the spherical housing rolls;

As discussed above for limitation 1(c), the exterior drive 1001 serves as the claimed accessory device. Smoot discloses that the "exterior drive 1001 may magnetically interact with the interior drive 1002 to maintain a relative position with each other on opposite sides of the sphere sidewall 1012." (Ex.1009:16:58-60; *see also id.* at 5:5-14,23-30;14:56–15:30;16:8-12;17:34-37,60-63;Figs.7,10). The exterior drive may include multidirectional wheels, ball bearings, or similar mechanisms allowing the exterior drive to roll on the exterior surface of the sphere as the sphere rolls, thereby maintaining contact with the exterior surface of the sphere as the sphere rolls. *Id.* at 14:56–15:30;16:12-25;17:34-37.

> Also, the vehicle includes an interior support operatively attached to an end of the support beam opposite the locomotive drive. The interior support contacts the interior surface and includes a first magnetic holding portion. The vehicle also includes an exterior support contacting the exterior surface of the substantially spherical body on an opposite side of the sidewall as the interior support. The exterior support has a second magnetic holding portion in magnetic interaction with the first magnetic holding portion to produce an urging force relative to said interior and exterior supports.

Id. at 5:5-14.

> In one embodiment, the interior support may be a castored or gimbaled cylindrical magnet held against the top inside of the sphere that magnetically

> attracts the exterior support which may also be a castored or gimbaled cylindrical magnet. Thus the external cylindrical magnet may be constrained to roll along with the internal cylindrical magnet. Alternatively, both of the interior and exterior supports may be a holonomic drive.

Id. at 5:23-30.

> The interior structure 910 may be a magnetic structure interacting through the sphere side wall with an exterior structure 920. The exterior structure 920 may be urged against an exterior portion of the sphere 911 by way of magnetic interaction with the interior structure 910. In this regard, the interior structure 910 and the exterior structure 920 may include mechanisms or structures that allow low friction interaction between the interior structure 910 and the sphere 911 as well as between the exterior structure 920 and the sphere 911, while facilitating continued contact between the interior portion and the interior structure 910 and the exterior portion and exterior structure 920. In this regard, the interior structure 910 or the exterior structure 920 may comprise rollers, gimbaled rollers, castored rollers, ball bearing rollers or any other appropriate mechanism or structure that allows for **constant contact with the surface of the sphere** while allowing for low friction movement of the sphere with respect to the respective structure.

Id. at 16:8-25 (emphasis added).

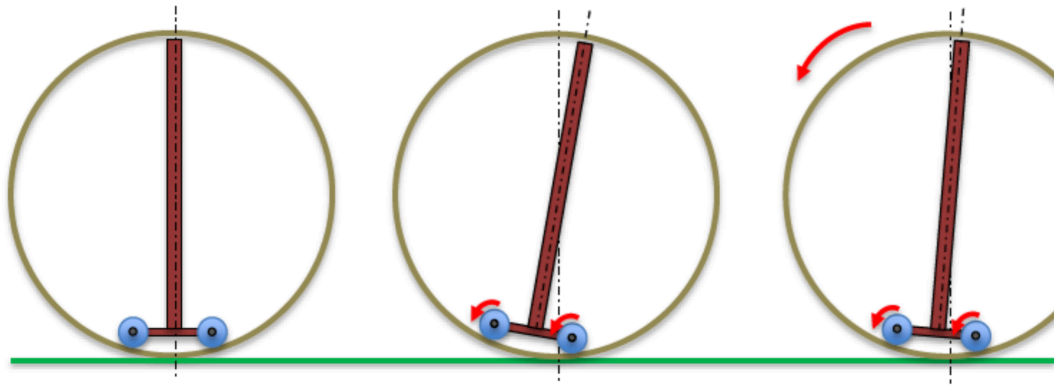
Claim [1(e)(i)]: wherein the drive system, in maneuvering the spherical housing, causes the internal component to angularly displace relative to a vertical axis of the spherical housing,

Smoot inherently discloses this limitation. Specifically, Smoot's locomotive driver 1050 (i.e., drive system) necessarily causes the support beam 1030 (i.e.,

internal component) to angularly displace relative to a vertical axis of the spherical body when maneuvering the sphere. (Ex.1012:¶¶52-76). As opined by Dr. Janét, the angular displacement of the support beam 1030 relative to the vertical axis of the spherical housing is a function of the acceleration of driver 1050. *Id.* at ¶56, ¶¶66-75. Therefore, the acceleration of the driver 1050 causes the support beam 1030 to angularly displace when maneuvering the spherical housing. *Id.* Petitioner notes that Dr. Janét's analysis of Smoot comports with the disclosure in the '920 Patent which ties acceleration to angular displacement of the internal component. (Ex.1001:10:30-33).

As shown in Fig. 10, the support beam 1030 is attached to the locomotive driver 1050. (Ex.1009:Fig.10,16:66–17:1). The support beam 1030 is a rigid body that is aligned with the vertical axis of the sphere when the locomotive driver 1050 is at rest in the center of the sphere and that supports the interior drive. (Ex.1012:¶60; Ex.1009:16:66–17:1,17:7-8 ("the drives [the interior drive 1002 and the exterior drive 1001] may both be supported by the support beam 1030 and the locomotive driver 1050.")). As the locomotive driver 1050 accelerates from rest, the driver initiates motion of the sphere by driving along the sphere's interior surface, moving away from the valley, and ascending the inner wall of the sphere. (Ex.1012:¶¶60-63). As the driver ascends the sphere's interior, the driver pitches

up and causes the support beam to become angularly displaced as illustrated in the figure below:



Id. at ¶63.

Dr. Janét developed a Static-to-Dynamic Transition model showing that when Smoot's driver 1050 accelerates from rest, the change in the driver's acceleration causes an angular displacement of the support beam. *Id.* at ¶¶66-69. Dr. Janét also developed a Dynamic model showing the relationship between the driver's acceleration and the angular displacement of the support beam when the system is in motion. *Id.* at ¶¶70-75. The Dynamic model shows that variations in the acceleration of the driver 1050 cause variations in the angular displacement of the support beam 1030. *Id.* at ¶75. For these reasons, the driver 1050, in maneuvering the spherical housing, necessarily causes the support beam 1030 to angularly displace relative to a vertical axis of the spherical housing.

In the alternative, it would be obvious based on the knowledge of a POSITA for the locomotive driver 1050 (i.e., drive system) to cause the support beam 1030

(i.e., internal component) to angularly displace relative to a vertical axis of the spherical body when maneuvering the sphere. (Ex.1012:¶77). For the reasons described above, a POSITA would have expected that when Smoot's drive 1050 accelerates from rest, for example, the driver initiates motion of the sphere by driving along the sphere's interior surface and ascending the inner wall, the drive would pitch up causing the support beam to become angularly displaced. *Id.* For the reasons discussed above, a skilled artisan would also expect the angular displacement of the support beam to be a function of the acceleration of the driver. *Id.*

Claim [1(e)(ii)]: the magnetic interaction causing the accessory device to maintain continuous contact with the exterior surface of the spherical housing when the internal component is angularly displaced.

Smoot's locomotive driver 1050 is attached to support beam 1030, which is in turn attached to interior drive 1002. (Ex.1009:Fig.10,16:61–17:8). A POSITA would understand that the angular displacement of support beam 1030 would also cause the interior drive/support 1002 to angularly displace relative to the vertical axis of the sphere. (Ex.1012:¶57; *see also* MPEP 2114(IV) ("Functional claim language that is not limited to a specific structure covers all devices that are capable of performing the recited function.")). Smoot discloses that the magnetic interaction between the exterior drive 1001 (i.e., accessory device) and interior drive 1002 causes the exterior drive "to maintain a relative position with [the

interior drive/support 1002] on opposite sides of the sphere sidewall 1012." (Ex.1009:16:58-60). Because the locomotive driver supports the beam, which in turn supports the interior drive, then as the beam 1030 is angularly displaced within the sphere, the interior drive is similarly displaced relative to an interior of the sphere. (Ex.1012:¶57). Thus, the magnetic interaction between the interior and exterior drives ensures that the exterior drive is maintained in a relative position with respect to the interior drive on the exterior surface of the sphere as the support beam and interior drive are angularly displaced by the locomotive driver 1050. *Id.*

Additionally, Smoot discloses that the exterior drive may include rollers, ball bearing rollers, "or any other appropriate mechanism or structure that allows for **constant contact with the surface of the sphere** while allowing for low friction movement of the sphere with respect to the respective structure." (Ex.1009:16:19-25) (emphasis added).

Claim 2. The system of claim 1, wherein the drive system includes a pair of wheels which are operable to enable the spherical housing to spin on the underlying surface.

Smoot discloses that the locomotive driver 1050 (i.e., the drive system) may be holonomic and include multidirectional wheels:

> Alternatively, the locomotive driver 1050 may also be holonomic (i.e., the drive 1050 may employ multidirectional wheels 1051) and it may have a design similar to the drives 200, 300, or 400 (referenced in FIG. 2, FIG. 3

> and FIG. 4, respectively). In this regard, the locomotive driver 1050 may move in a holonomic fashion any direction along the XY plane corresponding to the surface 1028.

Id. at 17:16-23. Smoot further teaches that a "holonomic" system is one that moves in three degrees of freedom, including rotating or spinning about a vertical axis:

> Holonomic, in the field of robotics, refers to a system's ability to independently control all degrees of freedom of the system. For instance, an ambulatory robot designed to move about a surface or plane may generally exhibit at least three degrees of freedom. These may correspond to translation in both axes of the plane **as well as rotation in a direction generally perpendicular to the plane**. In order to be holonomic, the robot must be able to fully move in any one of these degrees of freedom independently of any other degree of freedom. For example, the ambulatory robotic system must be able to move in any direction along the plane without rotating in a direction perpendicular to the plane (e.g., move side to side and front to back without first turning or rotating).

Id. at 1:57–2:3 (emphasis added). Thus, the locomotive driver 1050 discussed for the embodiment of Fig. 10 includes multidirectional wheels and is holonomic (Ex. 1001:17:16-23), which enables three degrees of freedom including spinning the spherical housing on surface 1028.

The inclusion of multidirectional wheels that enable the spherical housing to spin is also described in Smoot with respect to the embodiment of Fig. 3. Further, the embodiment of Fig. 10 expressly incorporates the multidirectional wheels and

design of the embodiment of Fig. 3 for the locomotive driver 1050: "the locomotive driver 1050 … may have a design similar to the drives 200, 300 or 400 (referenced in FIG. 2, FIG. 3 and FIG. 4, respectively)." *Id*. at 17:16-20. Thus, the drive design in Fig. 3 may be employed as the locomotive driver 1050 internal to the sphere. The drive of Fig. 3 also includes "**a pair of multidirectional wheels** 308 on opposite corners of the drive 300." *Id.* at 10:33-34 (emphasis added). Each multidirectional wheel has its own independently controlled motor that enables the holonomic drive to rotate the spherical housing "**in a direction perpendicular to the XY plane** without translating in the plane" (i.e., "spin on the underlying surface"). *Id.* at 10:33-57 (emphasis added).

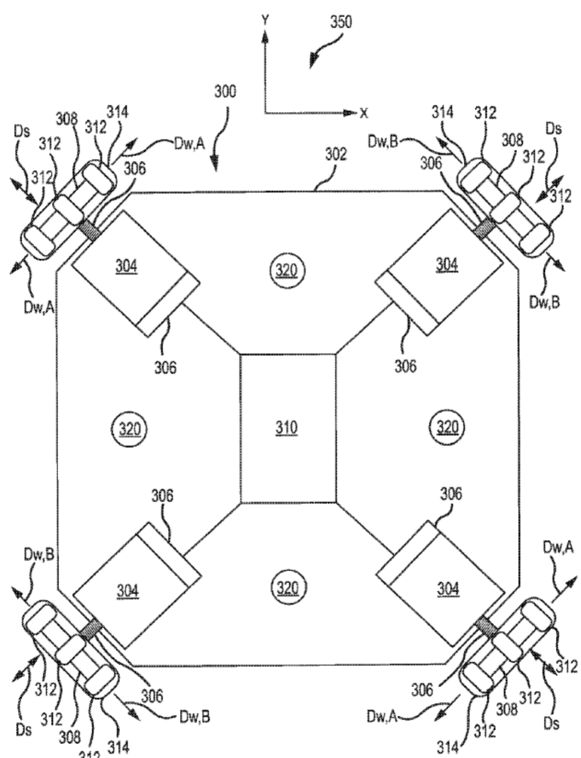


FIG.3

Id. at Fig.3; *see also id.* at 8:39–9:1;11:21-50;Figs.2,4.

Claim 3. The system of claim 1, wherein the one or more magnetic components of the self-propelled device include at least two magnets that are dispersed within the spherical housing to stabilize the accessory device.

Smoot inherently discloses this limitation. Smoot discloses that the interior drive 1002, which is within the sphere, may have a plurality of magnets dispersed in its chassis in order to align the interior drive with the exterior drive (i.e., accessory device). (Ex.1009:Fig.7(showing six magnets dispersed within the spherical housing);15:9-14(discussing that the arrangement of the magnets aligns the interior and exterior drives);17:1-3(discussing the interior drive "encapsulated" by the sphere)). Smoot further teaches that the multiple magnets as shown in Fig. 7 assist in "sandwiching" the spherical sidewall between the interior and exterior drives. *Id.* at 14:46-48, 14:60-66.

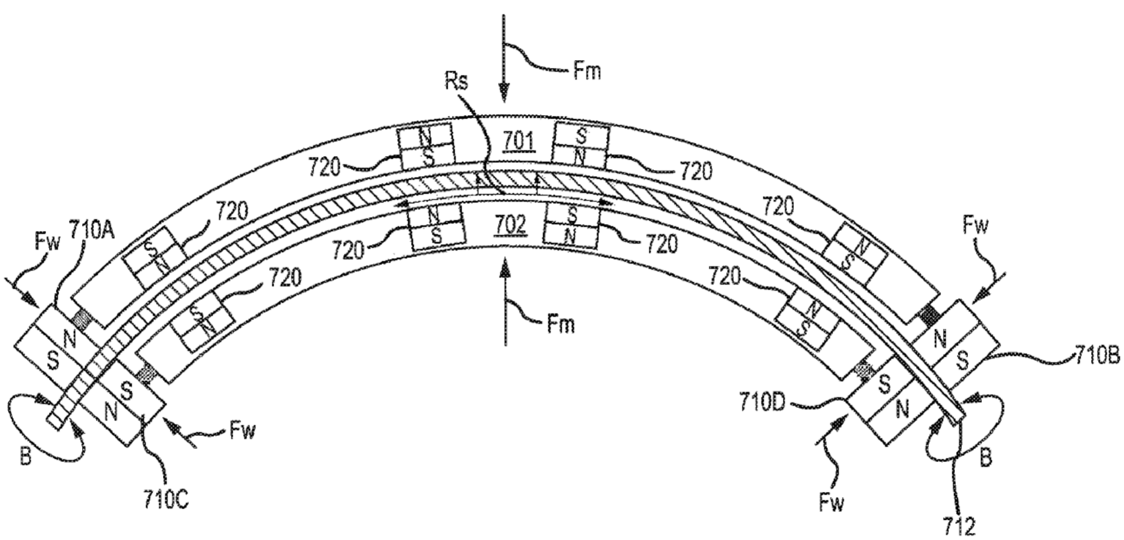


FIG.7

Id. at Fig. 7.

Aligning the exterior drive with the interior drive and sandwiching the spherical sidewall between necessarily stabilizes the exterior drive. (Ex.1012:¶¶79-81). Specifically, a skilled artisan would have understood that aligning poles of the magnets 720 in the interior drive with respective opposite poles of magnets 720 in the exterior drive would create a strong magnetic coupling that would be more resistive to outside forces, such as gravity. *Id.* at ¶90. A strong magnetic coupling would ensure that if the support beam pitches, the exterior drive would pitch with the support beam as if it were attached at the end of the support beam. *Id.* This would necessarily stabilize the exterior drive by making it less likely to decouple from the interior drive. *Id.* Additionally, the magnetic coupling show in Fig. 7 would necessarily stabilize the orientation of the external drive with respect to the orientation of the support beam. *Id.* at ¶91.

In the alternative, it would be obvious based on the knowledge of a POSITA that positioning a plurality of magnets in the interior drive chassis to align the interior drive with the exterior drive would serve to stabilize the exterior drive for the reasons described above. *Id.* at ¶82. A skilled artisan would have expected Smoot's exterior support to maintain its magnetic coupling with the interior support as the device maneuvers. *Id.* Therefore, it would have been obvious to include a plurality of magnets dispersed within Smoot's interior drive to form a

strong magnetic coupling between the interior and exterior drives in order to stabilize the exterior drive in the manner describe above. *Id.*

Claim 6. The system of claim 1, wherein the drive system maneuvers the spherical housing in any direction on the underlying surface when causing the internal component to displace.

When the locomotive driver 1050 maneuvers the sphere, the support beam 1030 (i.e., internal component) angularly displaces from the vertical axis of the sphere. *See* Claim 1(e)(i). As discussed for claim 2, Smoot further discloses that the locomotive driver may be holonomic and therefore able to move in "any direction along the XY plane corresponding to surface 1028." (Ex.1009:17:16-23). Petitioner incorporates by reference the arguments and evidence provided for claims 1(e)(i) and 2.

Claim 7. The system of claim 1, further comprising: a hardware component to control at least the drive system based on user interaction with the controller device.

Smoot's spherical device includes an internal controller 500 (i.e., "a hardware component") that generates control signals to "control motors 504A-D to move a drive with respect to a sphere or to induce or sustain motion of the sphere." (Ex.1009:12:49-51;2:51-59;11:51-59;Fig.5). The controller 500 also includes a wireless communications module 540 used "to receive commands from an external source (e.g., an operator supported by a drive or elsewhere) to control operation of a drive." *Id.* at 12:61–13:2;17:54-56("The movement of the object and sphere may

be accomplished … by way of outside control in communication with the controller.");11:51-59;Fig.5. Thus, Smoot teaches the claimed "hardware component" that controls the drive system of the Smoot spherical device and that receives instructions from an external source.

As discussed above for claim limitation 1(a), to the extent that Smoot does not expressly disclose the claimed "controller device" that receives user input or interaction, Wilson teaches such. In particular and as discussed for limitation 1(a), Wilson's controller device includes a user interface that allows the user to enter various forms of input via "mechanical switches or buttons, touchscreen input, audio input, gesture input, or movements of the [controller] device in a particular manner." (Ex.1010:[0121]). The user's interactions with the controller device "are interpreted as a command and signaled to the self-propelled device 710." *Id.* at [0123]. The self-propelled device receives the command and interprets it so as to cause the drive system maneuver in a specific direction, for example. *Id.* at [0029](discussing that the "controller device provides an interface to enable a user to enter two-dimensional control input about the X- and Y-axes");[0030](discussing that the controller device includes a user interface for controlling movement of the self-propelled device);[0031]-[0032];[0058];[0116-0123];Abstract;Fig.7.

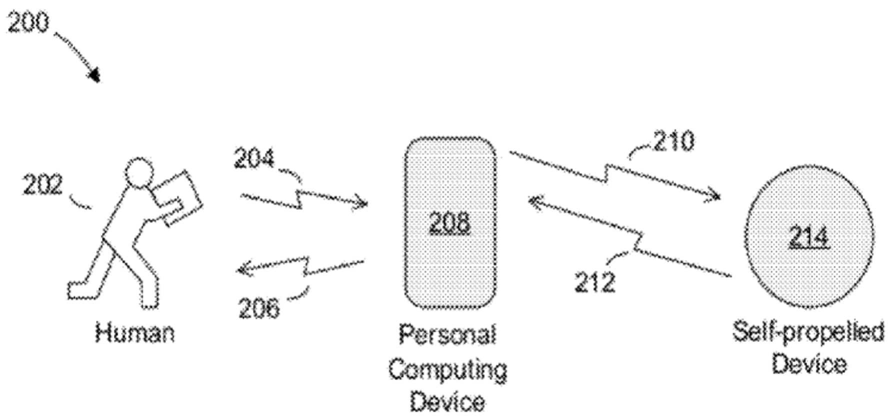


FIG. 2A

Id. at Fig. 2A.

For the reasons discussed above with regard to claim limitation 1(a), it would have been obvious to a POSITA to utilize a controller device, such as that taught by Wilson, as the external source used to generate and transmit control commands to Smoot's spherical device. *Supra* at 1(a). To the extent not already taught in Smoot, it would also have been obvious to enable or otherwise modify Smoot's internal controller 500 to control the locomotive driver based on commands generated by a user's interactions with the controller device as taught by Wilson. (Ex.1012:¶95). Smoot already teaches that the internal controller wirelessly receives commands from an "external source" or "outside control" that are used to control operation of the drive. (Ex.1009:12:61–13:2). Smoot also teaches that the "external source" may be an operator (i.e., "user"). *Id.* A skilled artisan would have understood that the purpose of any remote controller device,

including that taught by Wilson, is to allow a user to interact with the remote controller device to control another device. (Ex.1012:¶95). Therefore, it would have been obvious to allow an operator to interact with a controller device to provide wireless commands to Smoot's internal controller for controlling the locomotive driver. *Id.*

Claim 8. The system of claim 7, wherein the hardware component receives user input from the controller device that is in wireless communication with the self-propelled device, the hardware component implementing the user input to control the drive system.

For reasons discussed above for claims 1(a) and 7 and to the extent not already expressly disclosed in Smoot, it would have been obvious to modify Smoot's internal controller (i.e., "hardware component") to wirelessly receive user input from a controller device such as taught by Wilson. *Supra* at Claims 1(a) and 7. As also discussed above, it would have been obvious to modify Smoot's internal controller to implement the operator's command inputs to control the locomotive driver. *Id.*

Claim 11. The system of claim 7, wherein the hardware component causes the drive system to perform a feedback action in response to an event or condition.

The BRI of this claim limitation must at least include "wherein the hardware component performs feedback control to control operation of the drive system in response to a sensed event or condition." *Supra* at Section I.C. Wilson teaches using sensors to monitor conditions such as the self-propelled device's orientation:

> Sensors 112 provide information about the surrounding environment and **condition** to processor 114. In one embodiment, sensors 112 include inertial measurement devices, including a 3-axis gyroscope, a 3-axis accelerometer, and a 3-axis magnetometer. According to some embodiments, the sensors 114 provide input to enable processor 114 to maintain awareness of the device's orientation and/or position relative to the initial reference frame after the device initiates movement.

(Ex.1010:[0042]) (emphasis added).

The Wilson self-propelled device's processor uses the sensor input as part of a feedback control loop to control operation of the drive system:

> To produce directed movement of self-propelled device 402, the center of mass 406 is displaced from under the center of rotation 408, as shown in FIG. 4B. With movement, the device 402 has an inherent dynamic instability (DIS) in one or more axes (e.g., see Y or Z axes). To maintain stability, **the device uses feedback about its motion to compensate for the instability**. Sensor input, such as provided from sensors 112 (see FIG. 1) or accelerometers or gyroscopes (see FIG. 6), can be used to detect what compensation is needed. In this way, the device maintains a state of dynamic inherent instability as it moves under control of sensors and control input, which can be communicated from another controller device.

Id. at [0102] (emphasis added); *see also, id.* at [0107]-[0108] (Describing using feedback control to control speed and turns/rotations of robotic device), Fig. 5.

Smoot similarly teaches that the spherical device may include an inertial measuring unit for providing orientation information to the processor of the internal controller. (Ex.1009:12:35-37).

Smoot also teaches, with respect to the embodiment of Fig. 2, that the motors driving the multidirectional wheels may include encoder that communicates with the controller "to provide feedback to the controller 210 regarding the position and operation of the motors 204 and multidirectional wheels 208 for use in controlling the drive 200." *Id*. at 8:52-58. (Note that the embodiment of Fig. 10 expressly includes holonomic drives disclosed with respect to Fig. 2, as discussed at Smoot, 17:16-23).

Based on the teachings of Wilson and Smoot, it would have been obvious to a POSITA to enable or otherwise modify Smoot's processor to perform feedback control to control operation of the locomotive driver in response to the sensed orientation information (e.g., "condition"). (Ex.1012:¶100). As taught by Wilson, implementing feedback control would have the predictable result of compensating for instability, thereby making the system's motion more stable. (Ex.1010:[0107]); *see also* Ex.1012:¶101). As such, a skilled artisan would be motivated to modify Smoot's internal controller to perform feedback control to control the drive and achieve stable movement. (Ex.1012:¶101). As taught by Wilson, it would also be

advantageous to use feedback control to enable Smoot's spherical device to maintain a constant velocity and/or perform turns and rotations. *Id.*

Feedback control has been widely used to control motion in robotic systems for decades prior to the alleged invention of the '920 Patent. *Id.* at ¶100, ¶¶43-45. Therefore, a POSITA would have enjoyed a reasonable expectation of success applying well-known principles of feedback control to enable Smoot's processor to control the drive based on sensed orientation data. *Id.* at ¶100.

Claim 13. The system of claim 1, further comprising a plurality of actuators which cause the spherical housing to perform an emotive action.

Wilson teaches a plurality of actuators 126 that cause the spherical housing to perform an emotive action including head nodding, shaking, trembling, spinning or flipping:

> In one embodiment, **actuators 126 cause device 100 to execute communicative or emotionally evocative movements**, including emulation of human gestures, for example, head nodding, shaking, trembling, spinning or flipping. In some embodiments, processor coordinates actuators 126 with display 118. For example, in one embodiment, processor 114 provides signals to actuators 126 and display 118 to cause device 100 to spin or tremble and simultaneously emit patterns of colored light. In one embodiment, device 100 emits light or sound patterns synchronized with movements.

(Ex.100_:[0056]; *see also id.* at [0047](discussing the spherical device emulating a head nod or shake);[0054](discussing how actuators operate and exemplary actuators);Fig.1) (emphasis added).

It would have been obvious to a POSITA to include actuators in Smoot's spherical device that enable the device to "execute communicative or emotionally evocative movements" as taught by Wilson. (Ex.1012:¶103). Prior spherical robots developed over a decade before the '920 Patent communicated "emotions" through motions in order to facilitate emotional connections between humans. *Id.* at ¶103, ¶48. Smoot discusses that its spherical device is for the purpose of entertainment: "As one representative example, the holonomic drive system 100 may be used in an entertainment application." (Ex.1009:7:10-12). Additionally, Smoot envisions using its spherical device with an animatronic character or puppet and enabling movement of the spherical device for viewing by "bystanders, park patrons, audience members, or the like." *Id.* at 7:12-14,41-46. A skilled artisan would have appreciated that enabling Smoot's device to perform emotive actions, such as those taught by Wilson, would have predictably increased the device's ability to interact and form emotional connections with users. (Ex.1012:¶¶103-104). A skilled artisan would have reasonably expected that enabling Smoot's device to perform emotive actions, such as those taught by Wilson, would have enabled the device to have more successful interactions with lay-users. *Id.* at ¶104.

As such, it would have been obvious to improve similar spherical robotic devices in the same way. *Id.*

Claim 14. The system of claim 13, wherein the emotive action includes one or more of a head nod, a shake, a tremble, or a spin.

Wilson teaches emotive actions including a head nod, a shake, a tremble, and a spin. (Ex.1010:[0056]). For reasons discussed above with regard to claim 13, it would have been obvious to a POSITA to enable Smoot's spherical device to perform emotive actions such as a head nod, a shake, a tremble, and a spin as taught by Wilson. *Supra* at Claim 13.

Claim 15. The system of claim 1, further comprising: a processor to control at least one or more illumination sources to illuminate at least a portion of the spherical housing.

Wilson's spherical device includes a display 118, which may "include[] an array of Light Emitting Diodes (LEDs)." (Ex.1010:[0047]-[0048];Fig.1). A processor controls the LEDs (i.e., at least one or more illumination sources) causing them to illuminate the spherical housing in order to present information to users, for example. *Id.* at [0047](further discussing a display on the spherical device that can produce light in colors and patterns);[0048]-[0049](discussing that the display includes an array of LEDs and that "[p]rocessor 114 varies the relative intensity of each of the LEDs to produce a wide range of colors"); [0056] (Utilizing lights in combination with actuators "to execute communicative or

emotionally evocative movements"); [0127](discussing an "illumination output (e.g., LED display out)").

It would have been obvious to a POSITA to similarly include LEDs on the spherical housing of Smoot's self-propelled device. (Ex.1012:¶108). A skilled artisan would have appreciated that enabling Smoot's processor to control LEDs on the device's spherical housing would have predictably improved the device's ability to communicate information to the user. *Id.* As suggested by Wilson, it would be advantageous to enable Smoot's processor to control the LEDs in order to communicate information, such as device state, to the user. *Id.* Additionally, using lights on a self-propelled spherical robot to communicate information such as emotion to a user was also known for over a decade prior to the '920 Patent. *Id.* at ¶109, ¶48. A POSITA would have understood that enabling Smoot's processor to control LEDs on the device's spherical housing would have predictably improved the device's ability to also communicate "emotionally evocative" information to the operator as taught by Wilson. *Id.* at ¶110. As such, it would have been obvious to improve similar spherical robotic devices in the same way. *Id.* at ¶108.

Claim 16. The system of claim 15, wherein the processor illuminates each of the one or more illumination sources as a feedback response to a user interaction.

As discussed above, the BRI of this claim limitation must at least include a user interaction with a controller resulting in the self-propelled device's processor

altering the illumination output. Wilson teaches a user interaction with a controller resulting in the self-propelled device's processor altering the illumination output:

> In some embodiments or implementations, the input generated on the computing device 750 is interpreted as a command and then signaled to the self-propelled device 710. In other embodiments or implementations, the input entered on the computing device 750 is interpreted as a command by programmatic resources on the self-propelled device 710.… For example, a user may enter gesture input corresponding to a direction, in order to have the self-propelled device 710 move in a manner that is different than the inherent direction in the user input. For example, **a user may enter a leftward gesture, which the device may interpret (based on the runtime program 716A) as a command to** stop, spin, return home or **alter illumination output**, etc.

(Ex.1010:[0123]) (emphasis added).

It would be obvious to a POSITA to program Smoot's processor to alter the LED illumination output based on a user's interaction with a controller device as taught by Wilson. (Ex.1012:¶112). A POSITA would have understood that user inputs need not be limited to commands relating to control of the drive system. Rather, it would have been obvious to also enable the processor to interpret user inputs as commands to control other components of the spherical device, such as the LEDs. *Id.* Allowing a finer degree of control over Smoot's spherical device by allowing the user to control illumination output of the LEDs would have predictably allowed the user to customize operation of the device to his or her

liking. *Id.* Therefore, it would have been obvious to improve similar spherical robotic devices in the same way. *Id.*

Claim 17. The system of claim 1, wherein the spherical housing includes two hemispherical shells which are structured to open and allow access to internal electrical components of the self-propelled device.

Wilson teaches that the spherical housing of the self-propelled device is made of two hemispherical shells with an associated attachment mechanism allowing access to the device's internal electronic components: "In one embodiment, the envelope comprises two hemispherical shells with an associated attachment mechanism, such that the envelope can be opened to allow access to the internal electronic and mechanical components." (Ex.1010:[0092]; *see also* [0090](discussing outer spherical shell with inner surface and mechanical and electronic components enclosed by outer shell, collectively the "envelope").

Smoot is silent with regard to how an operator would access the spherical device's internal electrical components (e.g., processor, communications module, power supply, internal locomotive driver, interior drive, etc.). However, it would have been obvious to a POSITA to construct Smoot's spherical body out of two hemispherical shells with an associated attachment mechanism as taught by Wilson. (Ex.1012:¶115). A skilled artisan would have expected some mechanism allowing the user to access Smoot's internal electronic components for purposes of repair, for example. *Id.* Constructing Smoot's spherical body as suggested by

Wilson would have the predictable result of enabling access to the device's internal electrical components. *Id.* As such, it would have been obvious to improve similar spherical robotic devices in the same way by providing the spherical device as two hemispherical shells structured to open to allow access to the internal components. *Id.*

Claim 18. The system of claim 17, wherein the internal electrical components of the self-propelled device include an energy storage.

Smoot's internal controller "may include a power supply 530 that is capable of supplying power to the various components of the controller 510 (e.g., motors 504A-D, amplifiers 502A-D, etc.)." (Ex.1009:12:58-61,Fig.5). A POSITA would understand that Smoot's disclosure of a power supply 530 is an express disclosure of an energy storage. (Ex.1012:¶117).

Alternatively, Wilson teaches that the internal electrical components of the self-propelled device include energy storage 316:

> Energy storage 316 provides a reservoir of energy to power the device and electronics and is replenished through inductive charge port 326. Energy storage 316, in one embodiment, is a rechargeable battery. In one embodiment, the battery is composed of ithium-polymer [sic] cells. In other embodiments, other rechargeable battery chemistries are used.

(Ex.1010:[0094];Fig.3).

It would have been obvious to a POSITA to utilize an energy source, such as a battery, as the power supply within Smoot's spherical device. (Ex.1012:¶119). A skilled artisan would understand that batteries are well known power supplies and are commonly used to power electrical components within mobile devices. *Id.* As such, the simple substitution of a Smoot's power supply with an energy source such as a battery as taught by Wilson would have yielded the predictable result of powering the internal electrical components of Smoot's spherical device. *Id.*

Claim 21. The system of claim 1, wherein the internal component that positions the one or more magnetic components includes a carrier.

Smoot's support beam is attached to an interior drive/support "include[ing] a first magnetic holding portion" (e.g., "carrier"). (Ex.1009:5:5-8). As shown in the figure below, the interior drive 702 includes a carrier that positions a plurality of magnetic components 720:

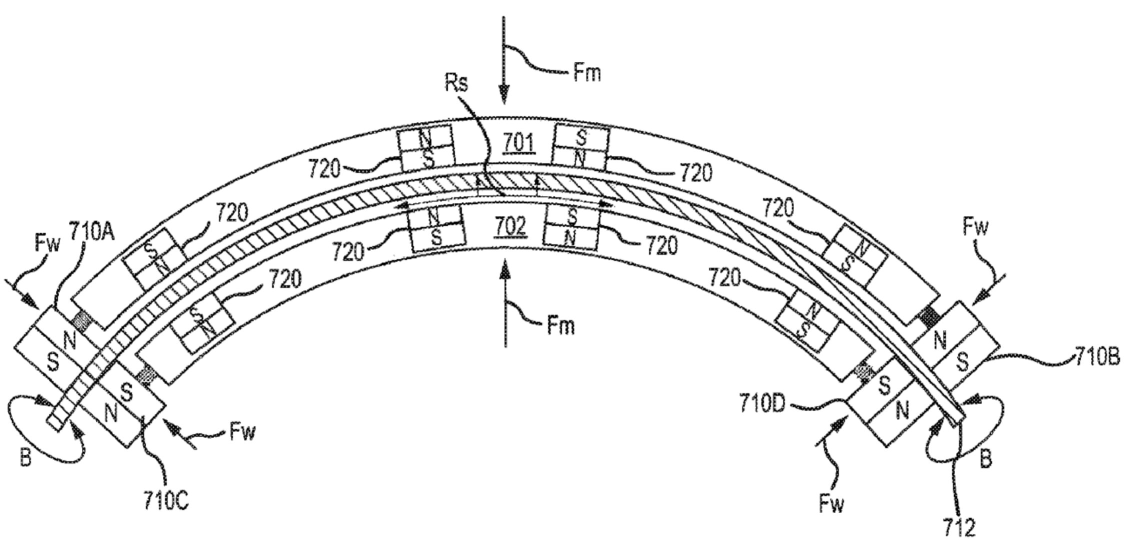


FIG.7

Id. at Fig. 7.

B. Grounds 3 and 4: Claims 1-3, 6-11, 13-18, and 21 Are Obvious Over Smoot, Wilson, and Van Kommer and/or Obvious Over Smoot, Wilson, Van Kommer, and the Knowledge of a Person Having Ordinary Skill in the Art

Van Kommer (Ex.1011) is directed to, at the least, the same field of endeavor as the '920 Patent. In particular, the '920 Patent is directed to self-propelled devices, such as mobile robots: "The self-propelled device 214 may be referred to by a number of related terms and phrases, including controlled device, robot, robotic device, remote device, autonomous device, and remote-controlled device." (Ex.1001:6:64-67). The '920 Patent further describes that its self-propelled device can be in many variations, including as "a radio-controlled aircraft, such as an airplane, helicopter, hovercraft or balloon. In other variations, device 214 can correspond to a radio controlled watercraft, such as a boat or submarine. Numerous other variations may also be implemented, such as those in which the device 214 is a robot." *Id.* at 7:14-19. Similarly, Van Kommer is directed to a "mobile robot" with "autonomous displacement means," such as wheels, wherein the robot can be controlled remotely. (Ex.1011:2:42-54,3:9-59,2:3-8). Therefore, Van Kommer is analogous art to the '920 Patent.

Claim 9. The system of claim 8, wherein the hardware component receives the user input directly from the user, and wherein the user input causes the drive system to maneuver the spherical housing in a particular manner that is determined from the user input by the hardware component.

Van Kommer teaches a mobile robot including a hardware component that receives user voice input directly from the user to control displacement of the robot. (Ex.1011:Abstract;6:45-47). The mobile robot includes a displacement module, such as an electric motor and wheels, and a hardware component including a processing unit, a microphone, and a voice analysis module. *Id.* at Abstract;2:44-52,55-57;3:45-52;Fig.1. "The microphone is connected to the voice analysis module and thus also enables a human operator within earshot of the mobile robot to control the displacements of the mobile robot through voice commands." *Id.* at Abstract. The voice commands are decoded by the voice analysis module and input to a program stored on the memory of the processor unit. *Id.* at 3:60-64. Control signals for the displacement module are generated based on the voice commands. *Id.* at 4:6-12;6:19-25. "[H]igh-level commands such as 'forward', 'left', 'stop', [and] 'return to station'" cause the displacement module to maneuver the robot in a particular manner. *Id.* at 6:19-25. Petitioner submits that the limitation "user input directly from the user" must at least include voice commands because claim 10, which depends from claim 9, recites, "wherein the user input corresponds to a voice command." (Ex.1001:15:27-28).

It would have been obvious to a POSITA to enable Smoot's spherical device to receive and obey voice commands from the operator as taught by Van Kommer. (Ex.1012:¶126). Specifically, it would have been obvious to incorporate a microphone, a voice signal-shaping module, a voice analysis module, and a sequential machine into Smoot's internal controller. *Id.* As described in Van Kommer, the voice input could be received by the microphone, shaped by the shaping module, decoded by the voice analysis module, and input to a program stored on the memory of the processor that generates control signals for the driver based on the received voice command. *Id.* Incorporating Van Kommer's voice control circuitry into Smoot's spherical device would have yielded the predictable result of enabling an operator to control Smoot's spherical device via voice commands. *Id.* A skilled artisan would also understand that these modifications to Smoot's internal controller would not impact any mechanical characteristics of the spherical device such as, for example, its ability to maneuver on a surface. *Id.* at ¶128. Incorporation of Van Kommer's voice controls would not change the principle of operation of Smoot's spherical device nor render it inoperable for its intended purpose. *Id.* A POSITA would also understand that Van Kommer's voice controls could be used to control Smoot's spherical device in addition to Wilson's controller device. *Id.*

As acknowledged by Van Kommer, voice controls were well known in the field of robotics for many years prior to the ’920 Patent and were known to offer greater flexibly in controlling mobile robots. (Ex.1011:1:36-40, 1:46-50); *see also* (Ex.1012:¶126). It was also well known that voice control features have been implemented in mobile robots well prior to the ‘920 Patent in order to make them more easily operated by laypersons. *Id.* at ¶126,¶47. Given these known benefits, a person of ordinary skill would have been motivated to utilize well-known voice control technology to improve the operator’s ability to control Smoot’s spherical device. *Id.* at ¶126. Additionally, it would have been obvious to use known voice control technology to improve similar mobile robotic devices in the same way. *Id.*

Claim 10. The system of claim 9, wherein the user input corresponds to a voice command, and wherein the hardware component comprises a processor to interpret the voice command as a directional command to cause the drive system to maneuver the spherical housing in a particular direction.

For reasons discussed above with regard to claim 9, it would have been obvious to a POSITA to modify Smoot’s internal controller (e.g., “hardware component”) to include Van Kommer’s voice control circuitry so as to enable the internal controller’s processor to interpret voice commands and cause the drive to maneuver the spherical housing in a particular manner. *Supra* at Claim 9. As also discussed above, Van Kommer teaches that voice commands may be directional commands, such as “forward” or “left,” that cause the drive system to maneuver the mobile robot in a particular direction. *Id.*

V. CONCLUSION

Petitioner respectfully requests that the Challenged Claims be canceled.

Date: April 20, 2017

Respectfully submitted,

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VI. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(A)(1)

A. Real Party-In-Interest Under 37 C.F.R. §42.8(b)(1)

Spin Master Ltd. ("SML") is the real party-in-interest. SML is the parent company for numerous subsidiaries located in various countries. SML specifically notes that Spin Master, Inc., a Delaware corporation, is a subsidiary of SML. The '920 Patent is not presently, and has never been, the subject of a lawsuit. 37 C.F.R. § 42.8(b)(2).

B. Related Matters Under 37 C.F.R. §42.8(b)(2)

The '920 Patent is not presently, and has never been, the subject of a lawsuit.

C. Lead and Back-Up Counsel and Service Information Under 37 C.F.R. § 42.8(b)(3) and (b)(4)

Petitioner provides the following designation and service information for lead and back-up counsel.

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APPENDIX OF EXHIBITS

EX1001	U.S. Patent No. 9,211,920 to Bernstein, et al.
EX1002	File History of U.S. Patent No. 9,211,920
EX1003	U.S. Patent Application No. 14/459,235
EX1004	U.S. Patent Application No. 14/035,841
EX1005	U.S. Patent Application No. 13/342,853
EX1006	U.S. Provisional Application No. 61/430,023
EX1007	U.S. Provisional Application No. 61/430,083
EX1008	U.S. Provisional Application No. 61/553,923
EX1009	U.S. Patent No. 8,269,447 to Smoot et al.
EX1010	U.S. Patent Application Publication No. 2012/0168240 to Wilson et al.
EX1011	U.S. Patent No. 6,584,376 to Van Kommer
EX1012	Declaration of Dr. Jason Janét
EX1013	Curriculum Vitae of Dr. Jason Janét
EX1014	U.S. Patent No. 933,623 to Cecil
EX1015	U.S. Patent No. 1,263,262 to McFaul
EX1016	U.S. Patent No. 2,949,696 to Easterling
EX1017	U.S. Patent No. 4,541,814 to Martin
EX1018	Masato Ishikawa, Ryohei Kitayoshi, and Toshiharu Sugie, Dynamic rolling locomotion by spherical mobile robots considering its generalized momentum, Proceedings of SICE Annual Conference 2010 2311 (2010)
EX1019	Aarne Halme, Torsten Schönberg and Yan Wang, Motion Control of a Spherical Mobile Robot, 4th International Workshop on Advanced Motion Control 259 (1996)
EX1020	U.S. Patent No. 4,601,675 to Robinson
EX1021	Daliang Liu, Hanxv Sun, Qingxuan Jia, and Liangqing Wang, Motion Control of a Spherical Mobile Robot by Feedback Linearization, Proceedings of the 7th World Congress on Intelligent Control and Automation 965 (2008)
EX1022	Hashem Ghariblu and Hadi Mohammadi, Structure and Dynamic Modeling of a Spherical Robot, 8th International Symposium on Mechatronics and its Applications (2012)
EX1023	Xialing Lv and Minglu Zhang, Robot Control Based on Voice Command, IEEE International Conference on Automation and Logistics 2490 (2008)

EX1024	Qiang Zhan, Yao Cai, and Caixia Yan, Design, Analysis and Experiments of an Omni-Directional Spherical Robot, IEEE International Conference on Robotics and Automation 4921 (2011)
EX1025	Martyn Williams, Sony unwraps high-tech 'healing' ball, CNN.com, published March 28, 2002, http://edition.cnn.com/2002/TECH/ptech/03/28/robodex.healing.ball.idg/?related, retreived on April 4, 2017
EX1026	U.S. Patent No. 5,676,582 to Lin
EX1027	Randall Munroe, New Pet, http://xkcd.com/413/, Retrieved from Internet Archive (http://web.archive.org/web/20080701080435/http://xkcd.com/413/) (2008), Retrieved on April 13, 2017.
EX1028	How a Small Robotics Startup Helped Disney Bring BB-8 to Life, US Chamber of Commerce (https://www.uschamber.com/above-the-fold/how-small-robotics-startup-helped-disney-bring-bb-8-life), Retrieved on March 31, 2017
EX1029	Meet BB-8: The New Droid in the Lives of Star Wars Buffs, Wharton School of the University of Pennsylvania (November 13, 2015) (http://knowledge.wharton.upenn.edu/article/meet-bb-8-the-new-droid-in-the-lives-of-star-wars-buffs/), Retrieved on March 31, 2017
EX1030	Hiroyuki Fujita, A Decade of MEMS and its Future, Proceedings IEEE The Tenth Annual International Workshop on Micro Electro Mechanical Systems (1997)
EX1031	Gene F. Franklin, J. David Powell, Abbas Emami-Naeini, Feedback Control of Dynamic Systems, Fourth Edition, Prentice Hall (2002)

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I hereby certify that this Petition complies with the type-volume limitation of 37 C.F.R. § 42.24(a)(1)(i) because it contains 13,338 words as determined by the Microsoft® Office Word word-processing system used to prepare the brief, excluding the parts of the petition exempted by 37 C.F.R. § 42.24(a)(1).

/Jennifer C. Bailey/
Jennifer C. Bailey

CERTIFICATE OF SERVICE ON PATENT OWNER
UNDER 37 C.F.R. § 42.105(a)

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b), the undersigned certifies that on April 20, 2017, a complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were provided via Federal Express to the Patent Owner by serving the correspondence address of record for the '920 Patent:

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